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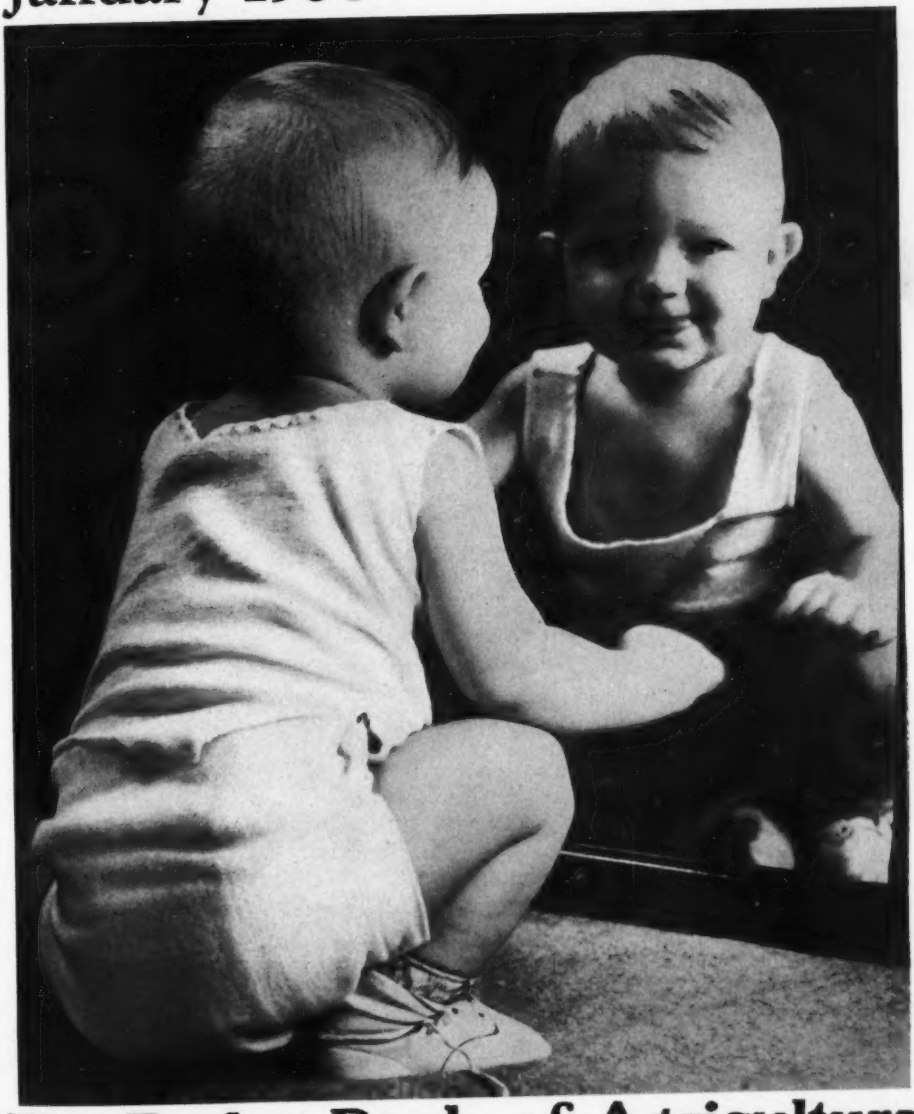

The Pocket Book of Agriculture

The NEED

QUOTED from an address delivered by C. A. Browne, Assistant Chief, Bureau of Chemistry and soils, U. S. Department of Agriculture:

"The maintenance of soil fertility can be accomplished only by restoring to the soil the equivalent of the plant food which has been removed with the harvested crop. . . . According to every criterion, there is an under-consumption of potash in American agriculture."

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POTASH COMPANY OF AMERICA

Baltimore Maryland

Better Crops with PLANT FOOD

The Whole Truth — Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XX NUMBER FIVE

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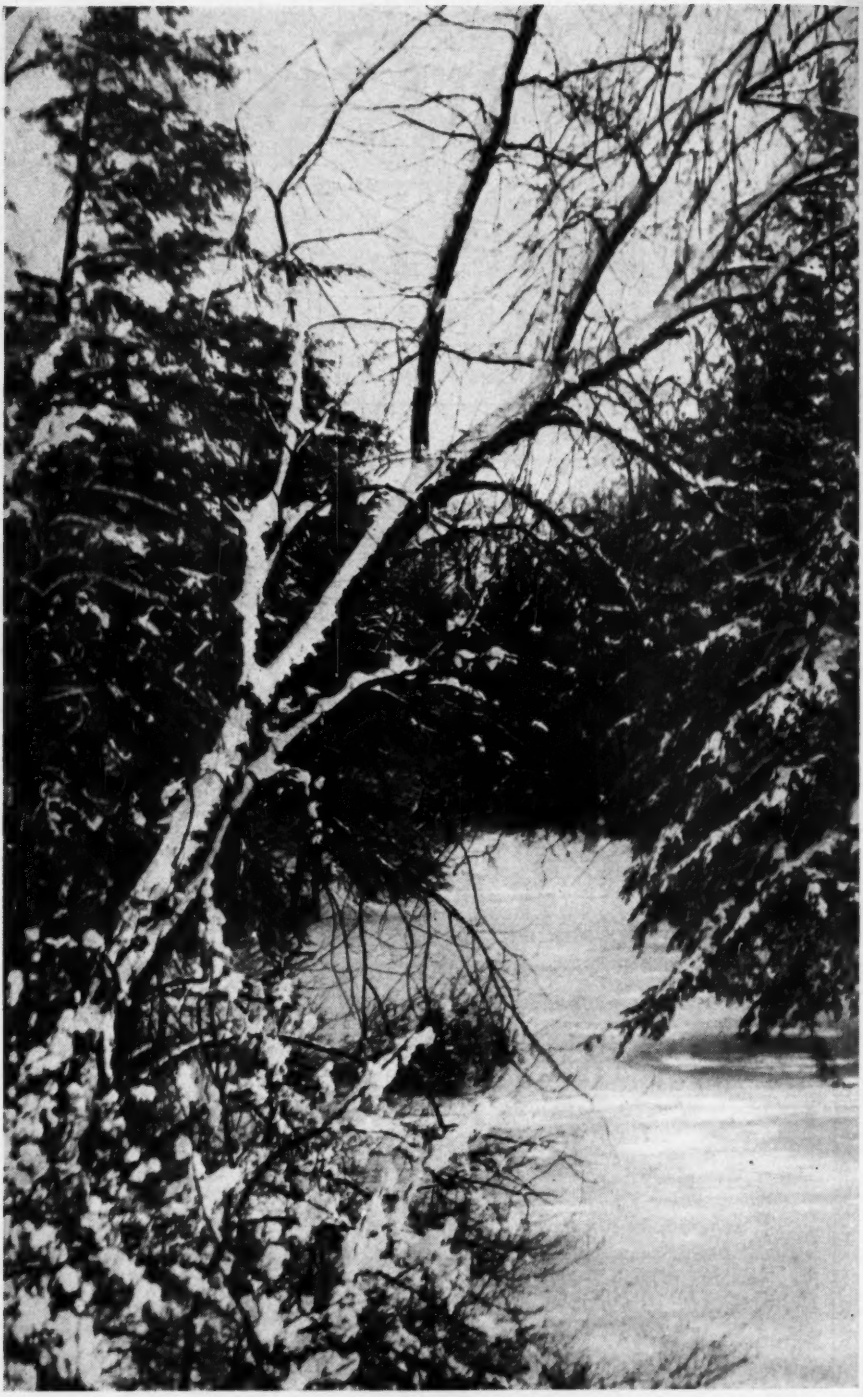

CLOSED FOR THE WINTER

Better Crops with Plant Food

Published Bi-Monthly by the Better Crops Publishing Corporation Incorporated under the Laws of the State of New York, with Offices in the Investment Building, Washington, D. C. Subscription, $1.00 for 12 Issues; 10c per Copy. Copyright, 1936, by the Better Crops Publishing Corporation, New York.

Vol. XX WASHINGTON, D. C., JANUARY, 1936 No. 5

Welcome Welfare

By Jeff McDermid

"WELFARE" is going to be a mighty big and imposing word in 1936. You need only scan the newspapers today to see how potent that old noun is bound to become before we meet on this page in another twelvemonth. Pick up some of those greetings you got by the basketful this New Year's Day, and somewhere will appear a reference to your welfare and perhaps that of your mother-in-law—unlikely as it may seem for these things to happen simultaneously.

Read the grand summary of the fiscal year issued by the banking fraternity and see if you can find the hidden word "welfare" in the puzzle of digits and hints of inflation. Never mind if it isn't staring at you; it's hovering around just the same. Bankers do not mention it so loud in election years. It's for quiet use in annual statements to stockholders.

It also bobs up at Washington, Distracted Center, where legal ponderosity and obscurity are now engaged in a tremendous threshing-bee. There nine judges are hunting in the chaff thrown over them for a few grains of truth anent the mossy old "welfare clause" in the Constitution, to determine whether Congress may use it any more except for campaign purposes.

Welfare in a country seems to me like health in the body. The more you talk about the symptoms of disease, and the way a case of colic, pyorrhoea, floating kidney, or jimjanders begins, the more "sartin" you are that you have contracted it incurably.

OF course, the analogy has already run its first course here, and when the farmers took sick we all began to run temperatures. Let's not be too historically clinical, however, but face in the convalescent direction, grasping a cane and a bottle of physic.

If we are a bunch of weepy-eyed and pale-jowled survivors of a few major financial operations, the cheerful New Year's conversation need not be marred by a lot of tripe about the stitches, the anesthetic, and the gas pains. We ought not to "fash ourselves," like old Scotch shepherds around a rickety lamb, about the chances we face of being afflicted anew or being run over by a new model without insurance. Upon our release from the ward we may not be quite lively enough yet to crack our heels together and whoopee, but we should resolutely face our undertakings without ghoulish mention of the undertaker.

Parenthetically, this doesn't prevent us from packing along a little caution. If we start being bumptious and greedy again, we are apt to get fatty heart or something; and when the fat is badly distributed, the body suffers—just like the country's welfare when unjust or unwise accumulations occur at given points, and anemia and emaciation develop elsewhere.

Now at first thought we would think it easy to discuss such a gladsome topic, and such a desirable objective, as our welfare. Yet before we proceed very far, the simple words of the old saw come to jar our prospects of indulgence. You all recall it, "What is one man's meat is another man's poison." That's why we don't all order oysters, lobster, or Welsh rabbit, despite the fact they are writ mighty large on the welfare signs of Broadway. If welfare were a spot on the map, all the guide-books would disagree as to the shortest and the best way to get there, and there would be plenty of people ready to drain your gas tank or puncture your tires, so they might get there before all the turkey was gone and all the soft beds taken for the night.

Why in the world such a worthwhile thing as welfare is set up as an idol with one hand and then shoved in the ash-can with the other, is more than my feeble philosophy can penetrate.

The trinity of welfare, split up for vivisection, consists of health, comfort, and prosperity. The first branch, that of good health, is relatively definite. Yet in our American scene an unhealthy or harrowed mind hurts a strong body oftener than it used to here and more than it does in the peasant realms of Europe.

ON the contrary, health is also something you can't force a guy to hang onto if he wants to overstock himself with comfort and prosperity. I know several chaps who started out with unspotted livers and strong gizzards. Today they have calcimined their tissues with so much vat virus and kettle grease that their general welfare is considerably hamstrung. They not only looked on the wine when it was red, but they demanded the whole fluid rainbow, regardless of its distilled origin. "To be merry," quaffed they, "one should guzzle and gobble."

They figured that Diamond Jim Brady, Nebuchadnezzar, and the international grand champion barrow thrived in history by keeping near the nick-nacks. "And as for the Consti-

tution," said they, "it's a tough old bird and we can always amend it."

Curious how blamed involved this becomes! I know still other old-timers who violated every rule of the Y. M. C. A. cafeteria and have teeth and bones as sound as ivory, despite a ton of tobacco, five hogsheads of intestinal varnish, and countless toxic menus. They claim to have enjoyed themselves, and maybe that's welfare.

But remember, we don't legislate and educate for the exceptional ones. That's left to the do-nothings who

believe in the survival of the fittest. It isn't safe to plot any health-welfare index curves on those old buzzards. Proceed with the case.

Next consideration is given to health exploited and prostituted by commercialism and armed conquest. Everything from the Hull House to Hopkins and Tugwell is allied in Red Cross work, patching up the former; and the League of Nations and the Sanctions are "pouring oil" on the troubled waters of the latter. Yet American efforts to maintain world peace are hampered by our efforts to save the pieces at home.

COMMERCIAL greed is not as rampant an enemy of health welfare as it was in the fifteenth century, but that's about the best we can say for it. We might notice here that the American motor speed mania killed more people in 1935 than all the slums and starvation combined. It seems that health welfare is not secured by resolutions and regulations quite as effectively and thoroughly as we might desire. It has, however, increased the average life expectancy nearly a decade in thirty years. Yet some claim that life expectancy is the only expectancy that has been bettered, but maybe they are misanthropes.

COMFORT is another stumbling block on our avenue of logic. To some extent it lends itself to regulation and to enforced standards, but there are exceptions.

I have known tree-sitters, human projectiles, devotees of broadside tattooing, marathon dancers, and obliging bridge-game volunteers. Regardless of long hours of personal torture and muscular discomfort, they have sacrificed their welfare to no indispensable cause. We get half our comfortable thrill entertainment out of somebody's silly discomfort, because we pay them for being uncomfortable. Thus we put a premium on being out of repose and in awkward and trying positions.

I have not looked in the debates on the Constitution to see if Alexander Hamilton or John Randolph had any opinions on our rights and duties to interfere in such cases of palpable infringement of personal welfare. If I find same, I will file a brief before election.

Comfort is also too variable a factor to be roped off and legislated around with must-do's and do-not's. Climate affects it, and we have a blamed lot of climate to consider. Personal whims alter it. It isn't measured in a standardized way for all. Save for broad limits of physical endurance one way or 'tother, comfort is too vague for me to recommend to my ambitious political friends as a field for their talents. The tariff and oleomargarine afford them far better targets.

If you think that "comfort" makes good legislative material, page the janitors, the landlords, the hotel-keepers, and the train and bus operators—yes, and maybe a brace of colored porters for extra testimony, in case the white man's word is insufficient.

ASK them among other useful and trivial questions, what are the proper lengths of bed-sheets, the right temperature for bathroom or parlor, the best kind of soap for the lavatory, and how much ventilation and humidity are required to keep everybody happy. Ask them how hot shaving water must be and how cold is a good drink. Find out, while you are still sane, how much coal is needed to heat a boarding-house for two old maids, four stevedores, and a guy with the rheumatism. Also be sure to ask them when to turn on the electric fan.

I'm trying to show that welfare is a kind of will-o-the-wisp. We all chase it. Some of us see it double, and others see it in many distant spots at once. How may we all catch up with it? Up to this point I hope my case is as clearly muddled as the Hoosac Mills argument or the N. R. A. sick chicken docket—to say nothing of what is ahead of us in the Guffey coal case, the T. V. A., and the nominating conventions. If I omit a few "and-ors" please be lenient with a layman.

Health, comfort, and prosperity,—and the greatest of these is prosperity! Which merely brings back anew that darned old, disagreeable question as to whether we know when we are well off! Those who do are always possessed of welfare, even enough of it to last six weeks after Christmas without looking for more.

It is disturbing to have the road to our mutual welfare turned into a race-course. It is on the path of money prosperity that most of the havoc occurs. Here possibly some adjustment of brakes and gears and plenty of traffic cops with shootin' irons are necessary day and night. No doubt if we had more of these preventives, there would be less need for the arnica, bandages, and restoratives used by poor-relief agencies.

The egg who would advance a plea of self-determination and the rugged right to drive as he pleases on the busy but overcrowded boulevard of business is going to get more than a ticket hereafter. They may even take some of his oil and gas to fill the tanks of a few sober and decent flivver drivers and then put a damper on his accelerator.

Yet it's queer how most folks not in the studious, academic, and cloistered group are bent on getting sudden financial prosperity, and how much time they spend in vexing their souls over those "32 millionaires" and the other dinosaurs in the upper quartile of fortune.

THUS envious, they fall prey to all manner of sham and chicanery, from counting dots, doing upside-down puzzles, and answering radio gags, to going in for old-age benefit bonanzas, bonus marches, and share-what's-left parades.

After all now, answer me this: what difference in covetousness is there between one of these and the limousine lizards, whose fabulous but uneasy incomes only make them restless and grasping? Just as we have said that "the boy is the father of the man," we may exclaim that the rich man is sired by his own original poverty.

I stand for reasonable curbs on commercial selfishness, but I am also in favor of a halter on pressure groups who help themselves to gravy by keeping foolish folks in a stew. These lobby artists really do not want a state of satisfaction to prevail or a

(*Turn to page* 45)

A liberal application of wood ashes on the above area changed the vegetation from moss and fern to a thick mat of wild white clover. (No seed or other treatment given except close grazing.)

Potash *and* Clover *for* Better Pastures

By Dr. A. R. Midgley

Research Agronomist, Vermont Agricultural Experiment Station

THE chief function of potash in pasture fertilization is to increase and maintain white clover. Legumes require much more potash than grasses, and while the soil may have a sufficient amount available for the latter, yet legumes, especially pasture clover, may readily respond to additional amounts.

While grasses usually respond immediately to added nitrogen, and the user can see results from his efforts the same season it is applied, response from minerals, such as phosphate and potash, is much slower. Maximum results are often delayed for a year or more after application. This is mainly because fertilizers are usually applied as top-dressings to established pastures, and these minerals move downward very slowly into the feeding root areas. On run-down pastures, where very little clover is present, maximum results cannot be obtained until the clover is established.

Fertilizer response greatly depends on the plant used, and for this reason it is difficult to say from chemical soil tests that there are, or are not, sufficient plant nutrients available. At the Vermont Agricultural Experiment Station, in both field and

greenhouse studies, certain soil types responded remarkably well to added potash when clover was the predominating plant, but when it was nil and grasses predominated, much less plant response was obtained. This is clearly shown in the table of experimental data obtained on Ray Tillotson's farm at Middlesex, Vermont.

These fertilizer test plots were started in the fall of 1931, and careful records were obtained during the past four years. Limestone was applied to all limed plots at a rate equivalent to one ton per acre. The rates of other materials used on certain designated plots were 300 lbs. muriate of potash, 800 lbs. 16 per cent superphosphate, and 250 lbs. sodium nitrate per acre. The nitrogen was applied early each spring, and all plots were cut rather frequently and managed in such a way as to promote the growth of existing wild white clover.

Many interesting data have been obtained from this experiment, and it is clearly evident from the table that nitrogen gave tremendous increases compared with the other treatments during the first year. This was mainly because grass was the predominating plant, but after two years, clover became the predominating plant on all plots where potash was used, especially in combination with phosphate.

YEARLY PERCENTAGE INCREASES IN YIELDS FROM USE OF VARIOUS FERTILIZERS OVER NO-LIME CHECK PLOTS

Plot No.	*Soil Treatment*	*Year* 1932 %	1933 %	1934 %	1935 %
1	Limestone Only..	10	6	50	68
2	Lime and Potash	50	55	80	172
3	Lime and Phosphate	25	11	45	70
4	Lime, Potash and Phosphate..	85	175	185	400
5	Lime, Potash, Phosphate and Nitrogen	387	190	343	450

At the beginning of the experiment nitrogen with minerals and lime gave nearly 400 per cent more herbage than the check plot without any treatment, while potash and phosphate only gave an increase of 85 per cent. After four years, however, minerals and lime without nitrogen gave practically as much total material as the same treatment with nitrogen. Phos-

Without fertilizer this check plot has continued to get worse each year. At the present time it is mainly moss, wild strawberry, and sheep sorrel.

phorus alone, or in combination with lime, has given very little response on this soil. In fact, during the past four years, the turf on these plots, as well as on the check plots, has continued to get worse, and it is now rather mossy with considerable wild strawberry present.

This is strikingly different from plots where potash is used alone, or in combination with phosphate, since these plots have a very good clover turf, as readily can be seen in the illustrations. Just why phosphate with lime has not been more beneficial on this soil, which is so low in this mineral, is difficult to understand, because most pasture soils respond readily to added phosphate. While it is true that potash gives greater response than phosphate on this soil, neither one alone can be recommended because of its apparent relationship to the other. In fact there is some evidence that potash helps to maintain phosphate in an available condition on this soil.

In most pasture programs nitrogen has been given a prominent place, but recently clover instead of nitrogen has been receiving considerable attention for permanent pastures. The main reason why pasture clover has not been more satisfactory is that we have not realized that the fundamentals necessary for maintaining it are very different from those for maintaining grasses. For example, pasture clover requires high mineral fertilization with close grazing, while grasses require high nitrogen fertilization without close grazing.

Poor methods of seeding and handling pastures are another reason why it is difficult to obtain a good clover turf. The common practice on the better pasture fields is to plow the land, put it in a rotation, and ultimately turn the meadow into a pasture. Good pasture mixtures are seldom seeded in the rotation, and even the clover that would naturally come in, together with the low-growing bottom grasses, is shaded out by the hay crop, or by the so-called "nurse crop."

It seems as though it will be a long time before the farmer becomes educated enough to realize that the "nurse crop" really nurses very little except his pocketbook; that is, he hopes to get a crop while the small

Potash and lime have greatly increased the amount of clover and grass and reduced the moss and wild strawberry. (Compare with check plot.)

Phosphate and lime without potash have not greatly increased the clover on this field.

grasses and clovers are being established. This works fairly well for some of the tall-growing grasses and clovers in hay mixtures, but it usually does severe damage to the establishment of low, prostrate pasture plants. A nurse crop, such as oats, barley, etc., should in many cases be considered a "controllable weed" because it competes with the other plants for light, moisture, and plant nutrients, and therefore helps to keep real weeds in check. But when cut or pastured off, a nurse crop does not readily come back to compete again as other weeds might do, and in this respect it is a controllable weed.

There is some virtue in a nurse crop which is sometimes overlooked, and that is its ability to produce a temporary turf and keep the surface soils somewhat more moist for the young seedlings to become established. However, it is very desirable to remove the nurse crop long before severe competition results and prostrate plants become erect.

Perhaps the most important fundamental necessary to produce a good clover turf is a liberal supply of minerals, together with proper management such as close grazing and the prevention of shading by grasses. Close grazing, however, should not be confused with over-grazing, because all green plants get their energy from the sun and most of their raw food from air and water. Therefore it is necessary that they are not overgrazed and grubbed so closely that very little green material remains above the ground.

Wild white clover is remarkable in its ability to withstand continued close grazing, and many results show that the herbage should not get more than four or five inches high if the clover is to successfully compete with the grasses. When nitrogen is used, even greater precautions are necessary, because white clover is a sun-loving plant and intolerable to shade. Since it is prostrate and not erect, it cannot stand competition with erect, growing grasses.

In addition to close grazing, a liberal supply of minerals is also very essential for clover maintenance; and since most pasture soils are low in these materials, they must be supplied in the fertilizer. It is very doubtful if pasture fertilizer recommendations

Potash, phosphate, and lime produced a good clover-grass turf which continued to get better.

have been adequate, in respect to these minerals, for proper clover maintenance. It should be remembered that the requirements of the soil and its existing organisms must first be supplied before the pasture plants can obtain their needs.

It seems highly desirable, therefore, to maintain a fairly high level of these minerals in pastures, as leaching losses are usually very small, and there is a rapid turnover from pasturage to manure which may quickly return to the soil and be used again. This is especially true in regard to potash because pasture plants require and contain large quantities, while grazing animals require very little potash as such either for bone, milk, or flesh, and thus they return most of it to the pasture in their manure. Since less potash is removed and sold off the farm in dairying than in any other type of farming, it should be comparatively easy to maintain a high level of potash once a good pasture is established and a sufficient amount of potash has been applied.

Practically all Vermont pasture soils are very low in available phosphate; therefore, it is more or less universally recommended. On the heavy clay soils in the Champlain valley, where available potash is quite high, outstanding results have been obtained from liberal addition of superphosphate alone, but even here some added potash can well be used to promote and maintain wild white clover. Some of the lighter soil types in the state have responded to potash more than they have to phosphate. This is especially true on the Berkshire soil type, as discussed in the table at the beginning of this article. On this same farm Mr. Tillotson has been able to maintain a good stand of wild white pasture clover with manure alone, which of course is rather high in potash.

Further evidence concerning the value of potash on this field is shown in an illustration where he applied wood-ashes which he produced while making maple syrup. The vegetation here changed from fern and moss to a very compact clover turf as shown in a close-up picture on the wood-ash treated area. Part of this benefit can be attributed to lime, because practically all clovers are lime-loving plants; but this wild white clover has

adapted itself to a rather acid soil, and it thrives quite well even on soils that are somewhat too acid for red clover.

Practical Varieties

Since there are several kinds of clover seed available for pasture purposes, it might be well to discuss some of their virtues and limitations. At present there are four more or less distinct white clovers which may be used for pasture purposes:

1. Ladino (mammoth or giant),
2. Commercial White Dutch,
3. English Wild White (Kent, etc.),
4. Native Wild White (more or less indigenous to this country).

These particular clovers are being grown in several parts of Vermont in an attempt to determine their yield and longevity with different fertilizer levels and closeness of grazing. Results are available for only two years, but they show some interesting facts.

Ladino clover cannot stand real close grazing as well as the others, because it is much more erect, with long stems and large leaves. Under rotational grazing, where the vegetation is allowed to get up six inches or more before being grazed, it has maintained itself quite well and has produced more pasturage than the other clovers. On the plots that are being closely grazed, the yields are low and it is rapidly being killed; but in all cases it has a remarkable recovery or come-back after being cut or grazed.

The ordinary commercial white Dutch clover, with growth habits between that of Ladino and wild white, is able to withstand somewhat closer grazing, but like Ladino, it is not as perennial as it should be for a good pasture clover, and some experiments where these clovers have been under observation for a longer time show that they often kill out after two or three years. The clover that remains after that time is often seed from some of the mother plants, or else the wild white clover which naturally comes in with proper management.

The two wild clovers referred to offer the greatest possibilities for permanent pasture where it is not desirable to put the field into crop rotation. The English wild clover is the cornerstone of the famous pastures in England which are very seldom, if ever, plowed. This English wild clover has been tried in this country with more or less success, but before it can be highly recommended, additional experimental data are necessary. The plant has remarkable pasture qualities in that it forms a very compact turf and withstands very close continuous grazing; in fact, close grazing is very essential for its maintenance. It is very prostrate, with short stems and small leaves—even the seed is somewhat smaller than the ordinary white Dutch clover.

Native Strain Best

The native wild white clover, or that which naturally comes in well-managed pastures, is very similar in growth habits to that sold as English white clover. Since the former has been grown in this country for a long time, it has no doubt become better adapted to our soils and climatic conditions than any other strain of clover. The main difficulty encountered, however, is that this seed can not be purchased, because we have in the past failed to realize that the wild white clover is different from the ordinary white Dutch, obtainable on the open markets, and have not attempted to produce locally grown seed. The main source of white Dutch clover seed is from foreign countries such as Italy, or southern states such as Louisiana; hence there is little wonder that it is not better adapted to the northern part of New England.

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Florida Grows Celery *for the* Nation

By J. L. Baskin

Orlando, Florida

FLORIDA produces more than one-third of the nation's celery, and when one realizes that our population of 125 million people consumes celery by the trainload, this is no small order. Celery is harvested from December through May, thus furnishing the national table for six months of the year.

Seminole county, located along the Saint Johns River, produces three-fourths of Florida's crop. Commercial celery growing in this area dates back about 25 years, and the area is still expanding. Considerable expansion is taking place in the lower end of the county where deep muck, hammock land is being brought under cultivation.

Sanford, the heart of the older district, is located on a low, level plain of Norfolk sand, gradually tapering off to Norfolk fine sand, Portsmouth, and into hammocks, swamps, and lakes. Flowing wells and underground tile furnish perhaps the best controlled irrigation and drainage found in the United States. The splendid physical condition of these soils and their comparatively level surface make them ideal for control purposes, thereby permitting intensive cultivation. In their native state, these soils were not considered especially fertile or productive.

The process of clearing, leveling, and tiling these lands requires a very

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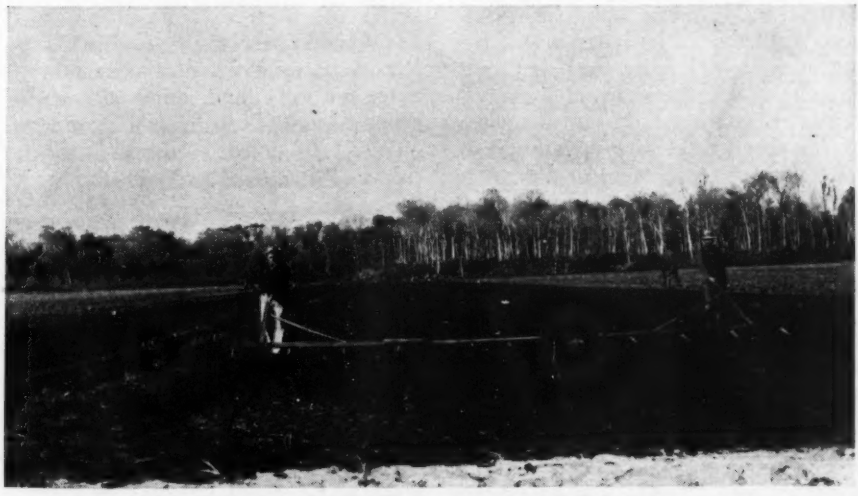

Laying out new areas in a muck hammock for the planting of celery.

The Inquiring Mind *and the* Seeing Eye

By Alister B. Alexander

Madison, Wisconsin

THIS month we are taking you on a trip to North Carolina, to visit a man who has made an enviable record in agriculture. He gave to North Carolina the soybean, that has since become a major crop over the entire nation, opening up practically limitless possibilities as a feeding element and as a base for many commercial products. The man upon whom we are calling is Charles Burgess Williams, Head of the Department of Agronomy at the North Carolina College of Agriculture and Engineering at Raleigh.

Professor Williams was born at Shiloh, Camden County, North Carolina on December 23, 1871, the son of Robert J. Williams and Susan Burgess Williams. The latter is still living at Elizabeth City with her only daughter. He grew up on a general farm and attended the rural schools of the district, at times walking six miles daily to and from classes. He later attended the Shiloh High School during the period from 1885 to 1889 and went to the Military High School at Littleton during the following year. On October 3, 1889, he entered the first class at the new North Carolina A. and M. College and graduated with highest honors, having specialized in agriculture and chemistry.

While a youngster Professor Williams worked on his father's farms during vacations, and in the evenings and mornings while attending school. The summer following his junior year in college was spent in Central New York on the farm of his professor of agriculture. His father and grandfather were fairly large landowners of some of the best farm lands in Camden and Currituck Counties, North Carolina. Demsey Burgess, an ancestor, was a member of the Provisional Congress at Hillsborough, N. C., in 1775, and at Halifax in 1776, at which time the Constitution of the State of North Carolina was drafted and adopted. The same Demsey Burgess was a Lieutenant Colonel in the Continental Army, and a Member of Congress for two terms while George Washington was President, so that he left as an inheritance not only land, but a rich background of the history of our country.

Religious Influence

As a boy Charles Williams joined the Shiloh Baptist Church, which is the oldest church in North Carolina, having been organized in 1727 at the home of William Burgess, another ancestor. The religious training received there remains as an important part of the character of Mr. Williams, as he is very faithful in his attendance at the First Baptist Church in Raleigh where he is a

deacon, and where his counsel and uprightness are leaned upon by the members of the congregation.

F. H. Jeter, editor for the North Carolina College, says, "In my opinion, Professor Williams is the outstanding authority in the South on soils and fertilizers. He was one of the first to recognize the value of a soil survey, supplying fundamental information necessary to a full knowledge of the fertilizer requirements of the various crops. He has consistently worked toward the end that every foot of land in North Carolina shall be surveyed before the job is completed, and it is largely due to his interest that such a large part of the State survey has been completed."

PROFESSOR C. B. WILLIAMS

After his graduation from college in 1893, Charles Williams was appointed Assistant Chemist of the North Carolina Agricultural Experiment Station and the Experiment Station of the Department of Agriculture. He served in this capacity from 1893 to 1896, when he left to attend Johns Hopkins University for a year on a state fellowship in chemistry. He returned to his old position in 1897 and served in it until 1906. In 1906 he became head of the Department of Agronomy; in 1907, Director of the North Carolina Experiment Station; and in 1917 was made Dean of Agriculture, serving in that capacity until 1924. During this period he was also in charge of the State Soil Survey in 1915, and Chairman of the Tobacco Research Committee in 1920.

Professor Williams also attended the National Graduate Summer School of Agriculture at Ohio State University. He is a member of Phi Kappa Phi and the Pine Burr Society, both honor groups; the American Society of Agronomy; National Grange; and is a Fellow of the American Association for the Advancement of Science.

Systematic Worker

Professor Williams' work has been marked by a methodical regularity. He has been one of the most faithful members of the North Carolina staff, going to his office day after day and year after year with very little time lost. A noticeable feature of his service to his state is that he has never allowed any information to go out under his name until it is based on the average results of many years of experimental data, and until he himself is convinced that it is right.

When he became interested in the soybean, many years before the plant had been propagated by the United States Department of Agriculture, he first secured every bit of information that he could gather and then published circulars and bulletins dealing with the subject, in order to acquaint North Carolina farmers with its possibilities. When the bean was first planted on a very small acreage in the eastern part of the state, Professor Williams immediately recognized

its worth and began a campaign to make it popular, a campaign that his associates say was so spectacular and interesting that it became known all over the United States.

Developed Library

Professor Williams, in line with his methodical ways, has always been careful to save and have bound all of the printed publications from the various experiment stations of the country, and for years the only agricultural library to be found at State College was that made up of the files in his office. Even now those who despair of finding certain agricultural information elsewhere instinctively turn to his office as a last resort, and usually get the information they desire.

Mr. Jeter says, "I have never, in our twenty years' association, called upon Professor Williams for an article dealing with any of the crops of North Carolina, any of the fertilizer problems of North Carolina, or any of the soil problems of North Carolina that he did not respond immediately with a clear-cut and readable story dealing with the question involved." That being the case, the State of North Carolina certainly has been enriched in its soil and fertilizer knowledge by Professor Williams, for we find listed during the period from 1896 to date some 230 articles, bulletins, and books of which he has been the author, either alone or with his associates. It hardly seems possible even for one so methodical to find time to turn out this mammoth amount of material, in addition to his class work, soil survey work, and other activities.

The articles referred to cover every imaginable subject in soil and fertilizer research. Among the most interesting published writings of Professor Williams and his associates is the report of the trip made by a party of twenty-two Southern agricultural leaders in the summer of 1928, of which party Mr. Williams acted as chairman. The study covered the soil-building and fertilizer practices of France, Switzerland, Germany, Holland, and Belgium. So that the greatest possible benefit might be derived from the findings of the party, a report was published upon their return, and it is interesting to note in this report the great difference between our methods and those of foreign farmers.

The party found that the European countries, densely settled and intensively farmed, require maximum returns from the soil in order to produce ample crops. Steep hillsides and the banks of streams produce vegetables and fruits for food. Even the wayside land along railroads is utilized. In some cases pear, apple, or peach trees are planted close beside, and trained to grow flat against, stone houses or stone walls to conserve space. In many of the districts visited they found the farmers living in small villages, going out each day to work their farms, which often consisted of only three acres. Most of the work is done by hand, and every attempt is made to prepare the land, cultivate the crop, and harvest it in such a way as to gain the maximum return. The handicap to economic production has been overcome, however, to a large extent, by large acre yields made possible by keeping the lands well fertilized, perfectly cultivated, and always busy producing crops.

Fertilizer Practices

Fertilizers are more extensively used, and one of the cardinal principles of fertilizer application in Europe is that the potash and phosphate should be applied to the field some time before the crop is planted. This method permits the material to become thoroughly incorporated in the soil before the seed is sown. Crop rotation is practiced with religious

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A well-kept lawn completes the beautiful setting for this farm home.

A Good Lawn *is* Its Own Reward

By T. D. Gray

Extension Landscape Architect, West Virginia College of Agriculture

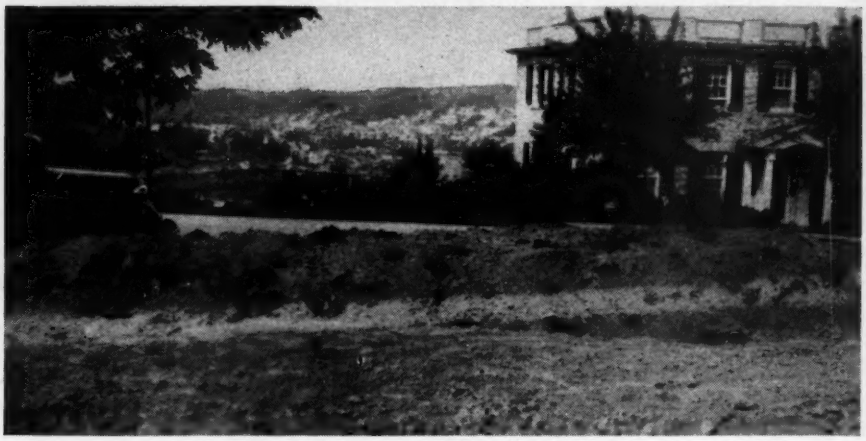
WHO has not seen a beautiful, green sward and wondered what magic the owner or his gardener used in developing and maintaining such a lawn? Probably very little had been done that any home-owner could not do if a good lawn is desired. Careful grading, drainage, good soil, sowing of proper grasses, proper fertilizing, mowing, pest and weed control, all contribute their part to the lawn.

A prominent landscape architect recently stated that proper grading, drainage, and soil preparation were the foundations of all landscape work. This is particularly true of lawn-making.

Proper grading is very important to give an interesting effect. In general, the area around the house should be level to give a restful feeling. Farther away the lawn may break more sharply; however, terraces should be avoided wherever possible. Few if any of our grasses will withstand the harsh, arid conditions on a terrace. All top-soil should be saved by removing the upper four to six inches of the area which is to be graded. The soil should be piled and replaced after the sub-grading is completed.

Soils differ very materially in their drainage requirements, sandy soils requiring the least drainage and

clay soils the most. Where drainage is necessary, three-inch agricultural tile should be laid in trenches 20 to 30 feet apart and from 2 to 2½ feet deep. A slope or fall of nine inches to one foot for each 100 feet of tile should be maintained. The main lateral can be drained into a ravine or sewer. Drainage not only removes surplus water, it permits air to readily enter the soil, which is necessary for best growth of the grasses.



Top-soil should be piled before the grading is started.

Some home-owners are blessed with fertile soil while others are handicapped by a lack of it. The latter must or should improve the soil before sowing. If humus is lacking, well-rotted manure at the rate of 500 to 1,000 pounds per 1,000 square feet should be added. Fresh manures are apt to be polluted with weed seeds; however, they may be treated to kill the weed seeds. The manure should be incorporated into the upper six to eight inches of soil.

Heavy clay soils can be improved by adding course sand or ashes to a fifth or more of the volume of the upper eight to ten inches of soil. The reverse is true of extremely sandy soils. The surface may be pulverized thoroughly by raking and re-raking with a garden rake. All stones, sticks, and anything which may make the lawn bumpy should be removed at this time.

The ground will be quite loose when first prepared and should be compacted by thorough rolling or by waiting for a soaking rain. The latter gives best results when following the rain, the lawn can be raked lightly and prepared for sowing. An application of complete fertilizer should be applied before the last cultivation, and worked into the upper four to six inches. Twenty-five to thirty pounds of a 10-8-6 fertilizer per 1,000 square feet of lawn may be used. It is particularly important, the experiment stations tell us, to get the phosphorus down around the grass roots. If the phosphoric acid is applied later on the surface, the soil acids fix it and it does not reach the roots and become available for considerable time.

The selection of a seed mixture will depend largely upon location. For most of West Virginia, Kentucky bluegrass makes the most successful lawn. In sections where they are native, such as Massachusetts and Rhode Island, bent grasses prove

most satisfactory for lawn purposes. Kentucky bluegrass does not make a lawn quickly and red top should be mixed with the bluegrass before sowing. Four parts of Kentucky bluegrass and one part of red top have given good results throughout West Virginia. A small portion of perennial rye grass or White Dutch clover may be added as a nurse crop. Some object to White Dutch clover due to its coarse foliage.

Success on acid soils has been obtained with a mixture of four parts Rhode Island bent and one part red top. The principal objection to the bent grasses is the extra work required to keep them in condition. This is particularly true of creeping bent, which requires frequent rolling and cutting.

Chewing's fescue or rough-stalked meadow grass (*Poa trivialis*) should be added for the shady locations. For dry, shady locations Chewing's fescue does well, and where the soil is moist, rough-stalked meadow grass gives better results. Where shade is intense, such as that under Norway and sugar maples, no grasses may succeed. Here Japanese spurge (*Pachysandra terminalis*) or myrtle (*Vinca minor*) may be used. Both are broad-leaved evergreens; however, they will not withstand hard usage. Thinning-out the trees by removing many of the branches throughout, and particularly the low branches to let in the light, will often result in success with grass.

Most success is had when the lawn is sowed in late August or early September. Grasses stool better in the fall and avoid the hot summer and weed competition which follows after spring sowing. By the succeeding summer the lawn is well established and better able to withstand the heat and weeds.

The standard Kentucky bluegrass mixture should be sown at the rate of three to four pounds per 1,000 square feet. Users should not skimp in the quantity of seed if a thick even turf is wanted. The best time for sowing is when the air is quiet, which is most often during the early morning hours. Sowings may be broadcast by hand or by a mechanical seeder. If sown by hand, the seed is divided into four equal parts and one part is sown by crossing the yard east and west. Another portion

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This yard after grading has dry stone walls to maintain grade differences.

"As a Man Soweth So Shall He Reap"

By C. J. Chapman

Soils Department, University of Wisconsin

TRAIN a boy in the way he should go, and when he grows up he will not depart from it." These may not be the exact words of the author, but they convey the meaning.

The early environment and training of a child, in other words the kind of soil in which he grows, determines to a large degree the kind of a man he is going to be. Fortunate is that boy or girl who has had the right kind of soil in which to grow. Early environment and early influences are of great importance. If we would harvest good fruit, we must plant good seed in well-fertilized and fitted soil, and then nurse the crop along in its early struggles with weeds and other adversities. And if we would succeed with alfalfa, there are certain definite requirements and conditions which must be met. Too many farmers have just sown the seed and then let nature take its course. The result of such careless planting is expressed in the early death of the little alfalfa seedlings, or at best a ragged, spotted, and uneven stand.

Largest Acreage in History

The largest acreage of alfalfa in history was seeded last year on Wisconsin farms. A million tons of lime were made available to Wisconsin farmers at reduced costs this past year, enough to cover an additional 300,000 acres of land. A work employment project sponsored by the College of Agriculture and prosecuted through the facilities of the Wisconsin Emergency Relief Administration, and the Works Progress Administration, state-federal agencies, made this possible. We estimate that an additional 300,000 acres of alfalfa have been seeded on Wisconsin farms this past year, which together with our 798,000 acres of old alfalfa puts Wisconsin well over the million-acre mark in total acres.

Insure Successful Stand

But what about the success of this 300,000 acres of new alfalfa? Has it made a successful stand? My answer is "Yes, on about 75 per cent of the land there is good catch, but yields in 1936 and in subsequent years will be low unless these fields were well fertilized." A good catch, or even a good stand, doesn't always mean good yields. Lime will go a long way toward the successful establishment of alfalfa on acid soils, but there are going to be failures. At least 25 per cent of the alfalfa seeded this past spring will fail, largely because farmers took a chance and sowed their good seed on fields that were in a low state of fertility or poorly fitted.

I believe that the successful establishment of alfalfa is almost 100 per cent certain if the land is properly

fitted, limed, and fertilized. I am not going to say that it will come through this winter 100 per cent. However, it is true that a strong growth of alfalfa the first year has a better chance of wintering than poor, weak, thin stands.

But I would rather see a farmer cut down his acreage and succeed, than to attempt too large an acreage and fail on part of it. It is true that lime is the foundation stone on which a soil-building program must be built, yet many soils need more than lime in order to successfully establish alfalfa and produce abundant crops. The lack of phosphate or phosphate and potash on many of our soils will prevent the alfalfa seedlings from making a good strong start in the early part of the season. The lack of fertility may result in complete failure to establish alfalfa.

You have all seen spots in a field where the alfalfa was rank and the stand perfect. You know that these spots were the result either of concentrations of plant food from manure piles or they may have been spots where brush piles were burned. You may have seen spots in fields where, years ago, straw stacks were burned. You know that the alfalfa, and even clover, here will frequently blossom out in the fall of the first year. Tests on soil samples from these areas invariably show a high phosphorus, potash, and lime content as compared with the rest of the field.

Test Soils First

There is no question but that our soils are less productive than they were in the early days. The leaf mold and organic matter of the virgin soil has long since been used up. We have pulled down the reserves of phosphorus and potash in our soils, and we know that the lighter sandy soils need potash even more than they need phosphorus. Some of our silt and clay loams which are a long distance from buildings, where little or no manure has been applied, are in an impoverished state of fertility.

And so we have been urging farmers who plan to seed alfalfa to have their soils tested first in order to check up on the fertility and determine what elements may be lacking. Our motto is: "Don't waste good alfalfa seed on land that is acid and in a low state of fertility. On the other hand, don't waste good lime or fertilizer on soils that do not need it."

During the past 12 months we tested over 15,000 samples of soil in our laboratories. We have found that about 75 per cent of these soils were low either in phosphorus or potash or both. Fully 80 per cent of all the soils we have tested in our

(*Turn to p.* 41)

In one of Wisconsin's best farming areas, barley as a nurse crop responded to fertilizer: no treatment = 25.7 bus.; 0-20-0 = 40.5 bus.; 0-20-10 = 50.4 bus. A striking difference in the growth of the alfalfa last fall promised added profits from the fertilizer in increased yields of hay in 1936 and subsequent years.

Science *and the* New Agriculture

By Morris Halperin

THERE is so much heard, said, and read nowadays regarding science and the new social and economic sciences that it would be enlightening to arrive at a clear conception of just what science is. If we do that, we will be in an intelligent position to test any new agricultural or general proposition carefully to find out whether it is in line with true progress.

A knowledge of what science is should be particularly timely, in view of the fact that, on the one hand, scientists are commencing to be greatly interested in presenting the facts and importance of their science to laymen, and on the other hand, laymen are now manifesting a true interest in science and in scientific information.

Science Means Knowledge

To begin with, our word science is derived from the Latin word which simply means knowledge, not necessarily University knowledge, nor technical knowledge, nor experimental knowledge, but any kind of knowledge. Indeed, when the word science was first inaugurated, there were no universities, no technical information of any kind, and no experimentation either. In those days science meant anything and everything which was known, believed, assumed, or even imagined. Indeed, the famous scientists, such as Archimedes and Leonardo da Vinci, of ancient and medieval times, literally knew everything from stars to bugs. The word science has gradually grown until now it properly denotes knowledge or information concerning anything, including the plowing of a field, the raising of a hog, the baking of a cake, or anything else which has ever been done by God or man. Thus it can be seen that the term science may be applied, without apology, to any form of knowledge.

Knowledge is Observation

Every existing science or knowledge has been born and raised by observation or experimentation, and usually by a combination of both. For instance, the farmers in ancient times observed that accidentally manured spots in the field produced taller pasture and heavier grain than the surrounding soil. They also observed that the grain crop following clover or alfalfa was bigger than the crop which repeated itself. These observations led to deliberate experimentation, in which manure and other fertilizers were added to a grain field and a deliberate system of crop rotation was followed. The expected increase was noted, usually, but not always. Why not always? Because there was no check treatment to show what the result would have been without the addition of fertilizer or without the inclusion of a legume.

In modern fertilizer experimentation there is an extensive plot-technique in which a check plot or treat-

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Pictorial

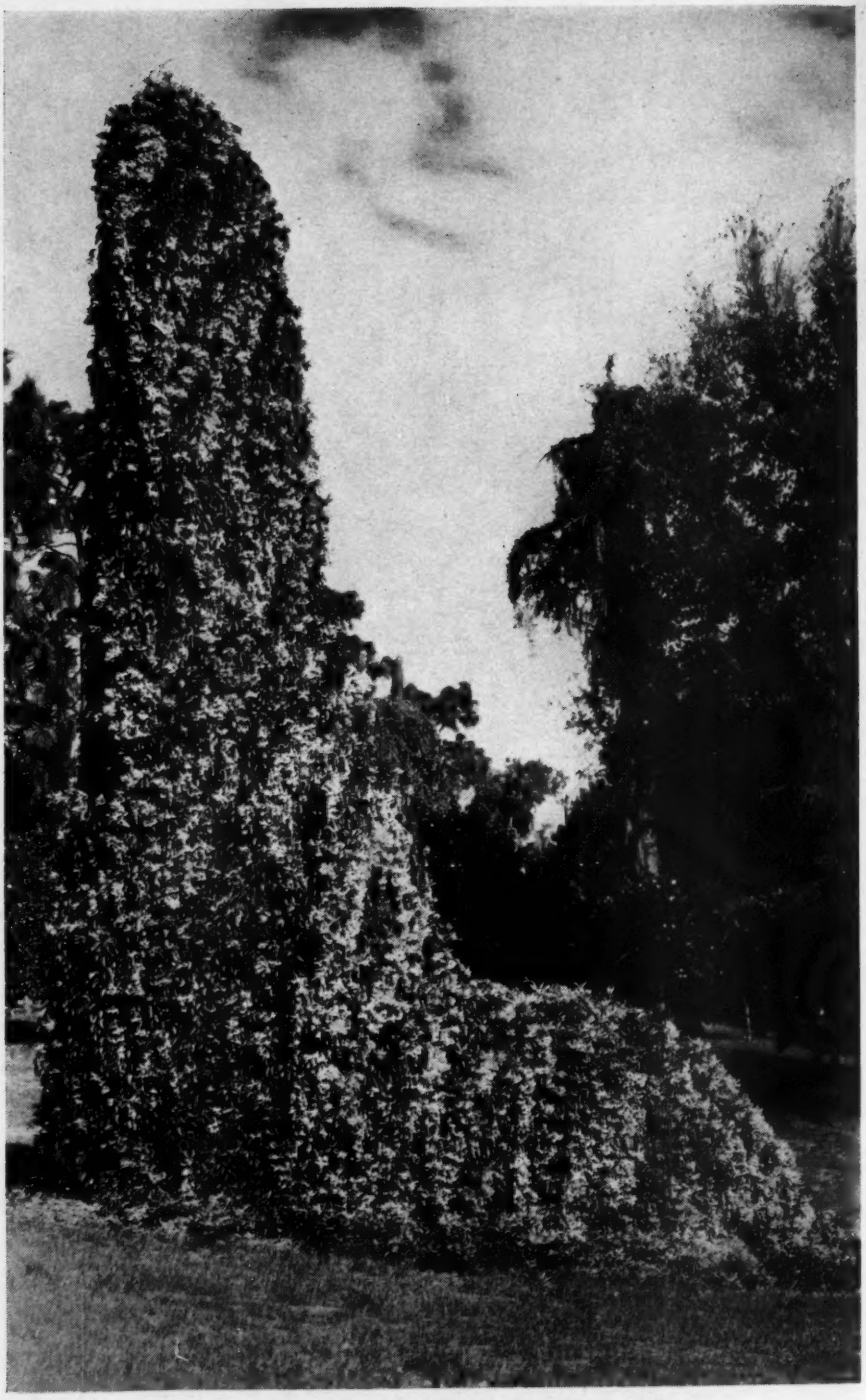
EVEN PLAY HAS ITS UPS AND DOWNS.

Many National and World problems are "settled" in scenes like the above.

Left: Typical of the "old-fashioned" chores on January days.

Right: "Oh, give me a home where the buffalo roam!"

Rope and cow pony are absent in modern branding and horn-clipping.



NATURE BUILDS HER OWN SKYSCRAPERS IN FLORIDA.

The Editors Talk

Protect the Cost

Among the many enterprises afoot for the establishment of agriculture on a permanent basis of enduring prosperity, none fires the imagination or arouses the enthusiasm as does soil conservation as now being promoted by the Soil Conservation Service.

A truth too obvious to warrant mention in time may be forgotten. In dealing with the complexities of agriculture, those of us whose lives are dedicated to agricultural betterment have too frequently permitted ourselves to become absorbed in the solution of the particular problem assigned us and latterly to become distracted by the more acute economic problems of agriculture, with the result that we have been prone to forget the ultimate truth that after all the basis of all agriculture is the soil, and the fundamental problem transcending all others is its maintenance in place and the perpetuation of its fertility. Meanwhile, the soil to which every problem is related has been depleted in plant food, in many instances to the point where even the cover crop, normally provided by nature, has been unable to persist, leaving the soil unprotected against the ravages of rain and wind and the soil itself to be carried away from beneath our unheeding feet. The insignificant quantities of plant food supplied from artificial sources have fallen far short of the requirement of the crops being grown, inevitably resulting in a depletion which all too frequently has passed beyond the point where even the hardiest of native growth can perpetuate itself.

The importance of soil conservation is beyond controversy, beyond the realm of political or other expediency, and is so secure from contravention that it is one idea on which all who have the slightest concern for the common or even the selfish welfare beyond the current moment, may unite.

Now Recognized as National Problem

For years there has been a "voice crying in the wilderness." For years that intellectual and physical stalwart, H. H. Bennett, witnessing the ravages of erosion from one end of his native land to the other, has plead with his official superiors all the way up to congressional committees and over their heads, so to speak, with the American people themselves, in many effective published articles, that something be done to stop it. Economy regimes for years blocked all but trifling pittances of appropriations. The budget had to be balanced.

But at last an end has come to timid temporizing. Soil erosion has now been recognized as something to be dealt with, and the nation has undertaken the job—aggressively, as a nation-wide problem, with a total of 141 demonstrational and conservational projects already established. "The effective practices employed in the demonstration areas are beginning to trickle across the project boundaries," in the words of Mr. Bennett, a trickle which we predict will grow into a flood. The state experiment stations are lending their

valiant assistance, and into the Service are being attracted many of the outstanding among the younger agriculturists, in their new work reflecting the enthusiasm of their chief.

The soil fertility problem here dealt with is in a sense unique in that, while fertilizers are generally applied to soils that are regarded as capable of producing a crop, here barren soils—subsoils exposed by erosion or by terracing—are required to yield a cover crop to hold them in place, the essence of the problem being to arrest erosion until a cover crop of sufficient density has been established. How is a cover crop to be grown to prevent erosion on a soil which by definition is being eroded because it is too infertile to grow a cover crop? The engineer designs and places his dams, slopes, and terraces in terms of expenditures—the major job, possibly to be done all over again if before the advent of the winter rains a cover crop be not established to hold the soil in place. Here obviously the agronomist's skill, acquired through long experience with complete fertilizers in growing two blades of grass where only one grew before, is as important as that of the engineer's. The agronomist places the capstone in the arch and by a trifling expenditure for plant food safeguards the benefits of the larger expenditures for engineering work. Already we find the beneficial results of fertilizer application being measured in terms of radically reduced erosion, developing the fact hitherto disregarded that there is a direct relationship between fertilizer use and erosion control.

Heretofore the benefits of fertilizer use have been measured in terms of the increased cash value of the crop produced. Here is a new measure—the value of the engineering work which the cover crop, efficiently fertilized, is enabled to protect from destruction.

Happy New Year!

Beginning with this issue, Better Crops With Plant Food will be restored to a monthly basis of publication. Since October 1931 we have been reaching our readers only once every two months. On the basis of the continued interest and support which you have given us during that time, we believe you will welcome again receiving the magazine every month. At this end, we are happy to be able to present with greater frequency the excellent articles which some of the outstanding agricultural scientists have planned for our pages.

Our circulation is national and international in its scope. With this in mind and with a full knowledge that the agricultural extension workers and research men are keen in their interest of what goes on beyond their own "line fences," we hope in each issue to vary the subjects to cover as many regions as possible. We shall want to hear from you. The magazine was designed and is edited for your interest. If you have no use for it, please tell us so in order that we may be spared the expense of sending it to you. If, on the other hand, you are particularly interested and we can cooperate by giving you more information along any certain lines, write us.

And so with the idea of entering into your new year, at least with as much interest and helpful information on problems of profitable soil and crop management as we can give, we wish you all a HAPPY AND PROSPEROUS 1936.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

In their resume and timely discussions of experimental results, A. L. Mehring, L. M. White, W. H. Ross, and J. E. Adams have released interesting data in U. S. D. A. Technical Bulletin No. 485, "Effects of Particle Size on the Properties and Efficiency of Fertilizers." The preparation of commercial fertilizers composed from particles of a homogeneous size is important to prevent segregation, the authors conclude. Fertilizers prepared from particles of different sizes tend to disassociate from each other under conditions such as pouring, settling, and vibration. A commercial fertilizer, although thoroughly mixed, may become rearranged when jarred or shaken, unless the particles are of similar size. Regrinding a segregating mixed fertilizer a little finer was found to reduce this fault considerably. The most efficient particle size was 80 to 150 mesh under the average circumstances determined from this study with grained fertilizers.

Of particular interest to commercial growers of sweet corn is a summary of extensive investigations to determine the most effective fertilizer combination for this crop as reported in University of Illinois Agricultural Experiment Station Bulletin 417, "Fertilizer Requirements of Sweet Corn," by W. A. Huelsen and M. C. Gillis. These authors have also issued a circular, No. 439, "Fertilizer Treatments for Sweet Corn," based on this work. A four-year rotation of wheat or oats, red clover, and two crops of sweet corn was employed in the experiments. Among several recommended fertilizer combinations of the 63 treatments under trial for five years, optimum results were secured with an application of 400 pounds of 0-16-12 per acre supplemented by 50 pounds of sodium nitrate as a side-dressing. "From the standpoint of maturity," the authors state, "commercial fertilizers are used for two purposes—to increase the total yield and to advance maturity." When the proper ratio of the fertilizer ingredients is used, each constituent serves a definite purpose. Nitrogen affects the vegetative growth; phosphorus promotes growth of the roots during the early life of the plant and later hastens the ripening process; and potash exerts an influence on the vigor and general health of the plant. The authors state: "Potassium-starved plants are not only stunted in the same way that plants are that lack nitrogen and phosphorus, but they may even fail to reach maturity." In all instances these studies demonstrated that maturity was hastened from three to five days with the proper application of commercial fertilizers.

"Some Responses of Yellow Transparent Apple Trees in Delaware to Various Nitrogen Treatments." Agr. Exp. Sta., Newark, Del., Bul. 195, *June* 1935, *F. S. Lagasse.*

"The Role of Zinc Sulfate in Peach Sprays," Agr. Exp. Sta., Urbana, Ill., Bul. 414, *Apr.* 1935, *K. J. Kadow and H. W. Anderson.*

"The Efficiency of Soil and Fertilizer Phosphorus as Affected by Soil Reaction," Agr. Exp. Sta., Wooster, Ohio, Bul. 553, *Sept.* 1935, *Robt. M. Salter and E. E. Barnes.*

"Progress Report of Fertilizer Studies with Jonathan Apples Upon Ephrata Fine Sandy Loam," Agr. Exp. Sta., Pullman, Wash., Bul. 319, *July* 1935, *F. L. Overley and E. L. Overholser.*

"Effect of Alfalfa and Farm Manure on Yields of Irrigated Crops in the Great Plains," U. S. D. A., Washington, D. C., Tech. Bul. 483, *Sept.* 1935, *Stephen H. Hastings.*

Soils

An instructive publication dealing with investigations of orchard-soil relationships, namely, "Soils in Relation to Fruit Growing in New York, Part VIII," is available in Cornell University Agricultural Experiment Station Bulletin 633, by Joseph Oskamp.

As a result of studies conducted in 66 Baldwin and Greening apple orchard units in Orleans county, the author arrives at several noteworthy conclusions which should prove valuable information to orchardists in other areas. It is disclosed in this discussion that soils uniformly sandy in texture and of a uniform brown color in the first two feet are better drained and support productive orchards. On the other hand, a soil of the same texture but having a gray layer with a gray and mottled subsoil is poorly drained, producing relatively low yields in orchards growing on a soil of this nature.

It was found that productive orchards would likely develop on soils where silt and clay are contained in the profile that shows considerable grayness in the upper subsoil and mottling in the lower subsoil if they have moderately rapid surface drainage or internal drainage so that the free carbonates will leach out of the surface three feet. However, profiles of the same general description but with a more highly developed gray layer, slow surface drainage, and calcium carbonate within three feet of the surface, will support orchards of relatively low production.

"Disinfesting Soils by Electrical Pasteurization," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 636, *July* 1935, *A. G. Newhall and M. W. Nixon.*

"Selenium Occurrence in Certain Soils in the United States with a Discussion of Related Topics," U. S. D. A., Washington, D. C., Tech. Bul. 482, *Aug.* 1935, *Horace G. Byers.*

"Soil Survey of Luce County, Michigan," U. S. D. A., Washington, D. C., Series 1929, *No.* 36, *J. O. Veatch, L. R. Schoenmann, C. E. Miller, and A. E. Shearin.*

"Soil Survey of Grant County, Oklahoma," U. S. D. A., Washington, D. C., Series 1931, *No.* 10, *A. W. Goke, C. A. Hollopeter, and M. E. Carr.*

"Soil Survey of Texas County, Oklahoma," U. S. D. A., Washington, D. C., Series 1930, *No.* 28, *E. G. Fitzpatrick and W. C. Boatright.*

Crops

Vegetable growers in the Southwest may be guided materially by a splendid reference manual, "Vegetable Varieties for the Winter Garden Region of Texas," Bulletin 508 of the Texas Agricultural Experiment Station, by Leslie R. Hawthorn. Included in this bulletin is a report on 590 varietal names representing 49 kinds of vegetables. The adaptability of varieties and the manner in which each is identified, diseases and insects to which the vegetable is most commonly subject, and general recommendations regarding the importance of varieties and the variations in stocks are given.

An effective method to curb the noxious crab grass and similar summer weeds in established lawns is prescribed in New Jersey Agricultural Experiment Station Circular 354, entitled "Crab Grass Control on Lawns," by Howard B. Sprague. The treatment recommended greatly improves the vigor of desirable turf grasses in the lawn. Since the permanent grasses continue healthy, steady growth for several months in the fall after the crab grass ceases active growth, and also make at least

two months' growth in the spring before seeds of crab grass and other undesirable weeds germinate, corrective measures outlined by the author are given during this period to restore density and vigor that will allow neither space nor light for crab grass seedlings to develop. The importance of raking the lawn late in the summer before mowing to lift prostrate stems of the weed and facilitate their removal is stressed. Subsequent operations include the application of either hydrated lime or finely ground limestone to correct soil acidity. It is also stated that an application of 15 to 25 pounds of a complete fertilizer analyzing about 5 per cent nitrogen, 10 per cent phosphoric acid, and 5 per cent potash per 1,000 square feet would stimulate turf growth when crab grass is dormant. The bare spots about the lawn should be reseeded with a suitable mixture of adapted grasses. To induce further growth of the turf grasses an additional application of commercial fertilizer early in the spring is recommended. The author advises less frequent watering in the warm months in order to prevent the stimulation of the crab grass seedlings. Instead, periodic deep watering is greatly preferred to frequent shallow sprinklings.

Growers of tomatoes for home and commercial utilization will receive much benefit from the revised edition of "Tomatoes for Canning and Manufacturing," issued in Farmers Bulletin No. 1233 by the U. S. Department of Agriculture. A thorough discussion of the important considerations in tomato growing is given by the author, James H. Beattie. The distribution of the tomato-canning industry, soils adapted and their preparation, selection of the varieties least susceptible to diseases, commercial fertilizers, and cultivation are among the subjects treated in this publication.

"Winter Barley, A New Factor in Missouri Agriculture," Agr. Exp. Sta., Columbia, Mo., Bul. 353, Aug. 1935, W. C. Etheridge, C. A. Helm, and E. Marion Brown.

"Twenty-five Years of Research," Agr. Exp. Sta., Durham, N. H., Bul. 287, Aug. 1935, F. C. Kendall, Director.

"Abstracts of Bulletins 489-502, Circulars 69-72, and Other Publications During 1934," College Station, Texas, Cir. 76, Dec. 1934, A. D. Jackson.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 332, Nov. 1935.

"Markton and Other Varieties of Oats," Agr. Exp. Sta., Pullman, Wash., Bul. 314, Aug. 1935, O. E. Barbee.

"Yields of Barley in the United States and Canada, 1927-31," U. S. D. A., Washington, D. C., Tech. Bul. 446, Mar. 1935, H. V. Harlan, P. Russell Cowan, and Lucille Reinbach.

"Classification of Wheat Varieties Grown in the United States," U. S. D. A., Washington, D. C., Tech. Bul. 459, Apr. 1935, J. Allen Clark and B. B. Bayles.

"Investigations on Runner and Fruit Production of Everbearing Strawberries," U. S. D. A., Washington, D. C., Tech. Bul. 470, Apr. 1935, George F. Waldo.

"The Native Persimmon," U. S. D. A., Washington, D. C., Farmers' Bul. 685, Rev. Aug. 1935, W. F. Fletcher.

"Flaxseed Production in the North Central States," U. S. D. A., Washington, D. C., Farmers' Bul. 1747, Sept. 1935, A. C. Dillman and T. E. Stoa.

"Variety Tests of Sugarcanes in Louisiana During the Crop Year 1932-33," U. S. D. A., Washington, D. C., Cir. 343, Mar. 1935, George Arceneaux, I. E. Stokes, and C. C. Krumbhaar.

"A Device for Separating Different Lengths of Fibers from Seed Cotton," U. S. D. A., Washington, D. C., Cir. 360, Aug. 1935, Homer C. McNamara and Robert T. Stutts.

"Safflower, A Possible New Oil-seed Crop for the Northern Great Plains and the Far Western States," U. S. D. A., Washington, D. C., Cir. 366, Aug. 1935, Frank Rabak.

Economics

Many interesting facts are portrayed in Washington Agricultural Experiment Station Bulletin 316, entitled "Part-Time Farming in Washington," by Ben H. Pubols. The study was inaugurated to depict the organization of part-time farms and obtain data concerning type of

farm, source and amount of income, occupation of operator, and other phases of part-time farming. The information should help those persons planning this mode of living. Using the author's own words in the introduction: "The objective sought by such small farm operators ordinarily is to decrease the cost of living by lowering house rent and by raising various food products for home use while working at some occupation not connected with the farm. The degree of success which may be achieved by this method of operation, more commonly called part-time farming, is dependent to a large extent on adequate knowledge concerning essential requirements." The author states that part-time farms are located mainly within or adjacent to urban and industrial centers. One of the chief findings as reported from this work is that nearly all part-time farms had a vegetable garden and a cow or poultry. The average gross value of farm products was $294 per farm.

"Economic Digest for Connecticut Agriculture," Conn. State College, Storrs, Conn., No. 63, Sept. 1935.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 5, Oct. 1935, and No. 6, Nov. 1935.

"Ohio Agricultural Statistics, 1934," Agr. Exp. Sta., Wooster, Ohio, Bul. 554, Sept. 1935, G. S. Ray, L. H. Wiland, and P. P. Wallrabenstein.

"Trend of Taxes on Farm and Ranch Real Estate in Texas," Agr. Exp. Sta., College Station, Texas, Bul. 512, Aug. 1935, L. P. Gabbard.

"Migration of Farm Population and Flow of Farm Wealth," Agr. Exp. Sta., Pullman, Wash., Bul. 315, Sept. 1935, Fred R. Yoder and A. A. Smick.

"The Farm Real Estate Situation, 1933-34," U. S. D. A., Washington, D. C., Cir. 354, Apr. 1935, B. R. Stauber and M. M. Regan.

Arbeiten Ueber Kaliduengung Potash Research

The above are the German and English titles of a new book * by Prof. Dr. Dr. h. c. O. Eckstein which has just been published as Vol. II to follow a book on the work of the agricultural experiment station in the Lichterfelde section of Berlin established by the German Potash Syndicate in 1929. The first book appeared in 1931 and was reviewed in the April-May 1932 issue of Better Crops With Plant Food.

The new volume, which will serve a wider group of readers because of its summary of each chapter printed in English, carries on with the important work done at the experiment station since the publication of the first book. It offers to research workers in definite form the Lichterfelde method of soil analysis, which is based upon the investigations of thousands of soil analyses from all over the world.

With particular reference to the United States, it is noted that there has been special interest in comparing conditions in the United States with those in Germany. "The function of the German farmer is to secure as large yields as possible, consistent with suitable quality, and especially maximum yields of crops rich in protein, fat and fibres, respectively. In the United States of America, however, where agricultural over-produc-

* "Arbeiten Ueber Kaliduengung"—"Potash Research" Vol. II by Prof. Dr. Dr. h. c. O. Eckstein, Landwirtschaftliche Versuchsstation, Berlin-Lichterfelde, 480 pages, 66 illustrations, price 6.75 Reichs Marks, Verlagsgesellschaft fuer Ackerbau m. b. H., Berlin SW 11.

tion during recent years has been an economic calamity, the problem is quite a different one. In most oversea countries the problem is to raise the quality of the crops, so far as quality influences the capacity of the market to absorb them, to as high a degree as possible and to promote the culture only on the most suitable soils and by the best possible crop treatment. In consequence of such agricultural conditions, our station has decided to tackle problems such as the investigation of the relationship between potash manuring and the length and strength of the cotton fibre and of the sisal hemp and how taste and keeping qualities of fruits and vegetables are influenced by the use of different potash fertilizers."

The contents of the book are divided into four main headings: I—Soil Research; II—Physiological Investigations; III—Investigations on the Influence of Commercial Fertilizers on the Chemical Composition and Nutritional Value of Food and Feeding Stuffs; and IV—List of Papers Published by the Experiment Station, Berlin-Lichterfelde.

Because, in the words of the author "In nearly every country today there is a general opinion that agriculture can only be made to pay by the intensive use of all auxiliary methods which science can place at the disposal of the practical farmer," this book should prove of great interest and value to many agricultural research and scientific workers.

Fertilizer in the Rotation

The value of good rotations has been known for a long time, but the practice has not been adopted in farming to the extent that it should be. In those sections where the same crop is grown on the land year after year, the soil soon becomes notoriously poor and unproductive. When a crop like tobacco or cotton is grown year after year on the same land, the soil organic matter becomes depleted, diseases increase, and the available plant foods become so low that profitable yields are no longer possible. Though only a small number of farmers grow the same crop continuously, there are far too many who follow a poor rotation or do not rotate crops frequently enough. Rotations which do not contain legumes do not, as a rule, give nearly so profitable returns as those which contain them. Frequently land is in one crop for several years then in another for several years, and so on for several cycles. This type of rotation, although better than growing one crop continuously, is very inefficient.

The primary object of a crop rotation is to build and maintain soil productivity. It should be a means of cutting down the amount of commercial fertilizer needed to produce profitable crop yields, but should never be considered as a substitute for needed fertilizer ingredients.

In view of the experiments which have repeatedly shown that fertilizer used on rotated lands is more efficient and profitable than fertilizer used on continuously cropped land, the rotation should be considered as a necessary farm operation and one that will give maximum returns on money invested in fertilizers.

There are a number of systems of fertilization based upon different principles. A few of these will be mentioned.

1—A system based upon the influence of a single element. This system assumes that so far as fertilizing

is concerned crops may be divided into three groups: (1) plants especially benefited by nitrogen, (2) plants especially benefited by phosphorus, (3) club plants especially benefited by potassium. In this system it is asserted that nitrogen is the dominant ingredient for wheat, rye, barley, grass, and oats; phosphorus for turnips, corn, and sorghum; and potassium for peas, beans, clover, and potatoes. This does not mean that one should fertilize with a single element, but that the element especially required by the particular crop be dominant in the fertilizer used. Thus specific fertilization is arranged for various rotations, each crop receiving that which is most useful.

2—A system based on the necessity of an abundant supply of minerals. This system requires that phosphorus and potassium be maintained in available form in amounts greater than required to meet the immediate needs of plants, nitrogen to be applied in available form when needed and in such quantities as will insure maximum yields. This system is useful in building up unproductive soils quickly.

3—A system based on the chemical analysis of plants. This system is based on the theory that the different plants should be provided with nitrogen, phosphorus, and potassium in the proportions in which they are found in the plants. This system may be applied to green-house crops and market garden crops, but usually is not economical or practical in field crop production.

4—A system in which fertilizer is applied only to the money crop in the rotation. In this system the crop in the rotation which gives the largest money returns per acre receives a heavy application of fertilizer. The application is much in excess of the immediate needs of the crops and the other crops in the rotation use the residual fertilizer left by the money crop.

This system is often used with potatoes and tobacco, which require, for best returns, an excessive amount of available plant nutrients in the soil. For example, a potato crop receives 2,000 pounds of a 7-6-5 fertilizer. This quantity is in excess of the amount used by the crop and there is left in the soil a considerable residue which may be used by the succeeding crops. This method possesses many valuable features and is perhaps as good as any for field crop production.

The last mentioned system applies to our Virginia rotations better than any of the others.

Other Rotations

In our tobacco rotations where 1,000 to 1,200 pounds of high-grade fertilizer is used, it should not be necessary to fertilize the grain and grass crops which follow. However, if only 500 to 600 pounds are used under the tobacco, it will be necessary to fertilize the succeeding crops for best results.

In the livestock sections where the rotation consists of corn, small grain, grass, and clover, with no money crop, the fertilizer should be distributed over the rotation. Such a rotation should get about 800 pounds of fertilizer distributed about as follows: 300 pounds on the corn, 300 pounds on the wheat, and 200 pounds applied in the spring when the clover is seeded. On the heavy soils well supplied with potassium, superphosphate should be all that is needed in this rotation. On the lighter gray soils a combination of phosphorus and potash should give best results.

In the potato rotation where a heavy application is made to the potato crop, the succeeding crops need not be fertilized.

In a peanut or cotton rotation, the corn and cotton crops should be well fertilized. If the crop preceding peanuts is heavily fertilized, it will not

be necessary to apply more to the peanut crop. However, if the crop received a light application, it will pay to fertilize the peanut crop with 200 to 300 pounds of, say, a 2-8-6 at planting time.

It should be emphasized that the rotation offers an excellent means for making the use of fertilizers more effective and economical, if they are judiciously distributed to the different crops in the rotation; but a rotation should not be regarded as a substitute for commercial fertilizers. *W. H. Byrne, Virginia Extension Division News.*

Science and the New Agriculture

(*From page* 22)

ment is a prominent feature. In fact, there can be no true experiment, at least with material things, without a check in the form of controlled conditions. When both of the conditions under experimentation are unknown, each acts as the check for the other. An instance of this is a trial of two fertilizers or poultry feeds, both of which are equally unknown to the experimenter. In such a case, the result of the experiment would obviously warrant a comparison only of the two conditions with one another. The inclusion in the experiment of a known or check condition, such as a plot with no fertilizer or a group of poultry receiving at the same time and place a feed whose effects are known to the experimenter, would serve as the check treatment for the experiment.

The purpose of an experiment is either to verify something known (or believed) or else to discover something new. In either case, the result enables the intelligent scientist to distinguish between fact and opinion, to find out what determines quality, or, when possible, to measure quantity. Usually, what is termed quality when applied to physical things—for example, the lusciousness of hay—can ultimately be reduced or related to a measure of quantity—for example, the percentage of water in the plant, or the physical condition of the soil, or the chemical composition of the fertilizer.

A fact is any impression truly perceived (not imagined) through the senses. For instance, any seeing person can detect as a definite fact both broad daylight and dark midnight. However, at about dawn or twilight, one cannot easily tell whether it is day or night. Nevetheless, the fact of passing from night to day and from day to night, although difficult of detection, is real. The point is, there are limitations to the scope and dependableness of the human senses.

Science serves to verify the impressions received through the senses, and also, when suitable instruments can be used, to detect and measure facts which are not perceptible to the senses unaided. An example of the latter is the use of a microscope to actually see what the naked eye cannot. However, there is a probable error, no matter how slight, in every scientific measurement, this being an unavoidable consequence of the general relativity and finiteness of all things physical, including instruments and man himself.

The so-called theoretical sciences had their beginning in practical necessity. Astronomy developed out of the need and desirability of ascertaining during what "moon" such operations as planting, irrigating, and fertilizing should be performed for maximum yields of grain. In fact, the earliest recorded event in all history, which occurred in 4241 B. C., is the formulation of the first Egyp-

tian calendar in which certain of the twelve months were called "Sprouting of the Grain," "Making and Watering Barley," "Ripe Grain," "Lady of the Granary," and "Grain Gods," names which clearly indicate the agricultural origin of this calendar.

Practical Beginnings

Thus we see that astronomy was at first purely practical and agricultural, not purely theoretical. To be sure, modern astronomy would seem to be as far away from agriculture as literally "the heavens are from the earth"; and yet, it is from this theoretical astronomy that modern scientific agriculture has derived its first knowledge of meteorology, climatology, and photosynthesis with their numerous applications of a very practical nature.

What is true of the beginning of astronomy is true also of mathematics. For example, arithmetical progression was first a practical undertaking. We learn this from the Rhind Papyrus, written in Egypt about 1650 B. C., of which Problem 64 reads as follows:

Distribute 10 measures of barley amongst 10 men in such a way that the shares shall have a common difference of $\frac{1}{8}$ measure. What is the share of each?

Problem 79 is interesting. In each of 7 granaries are 7 cats, each cat kills 7 mice, each mouse eats 7 ears of spelt, each ear produces 7 measures of grain; how much grain is thereby saved?

Geometry began with the necessity of calculating the best shape—whether cylinder, trapezoid, or parallelepiped, for an economical granary!

Virtually all the broad sciences were initially practical and economic. Theory is not imagination. Theory is the sum total of all known practice and serves as the basis for new practice, which in turn, confirms or enlarges the theory. The two are supplementary and inter-related.

In today's agriculture, theory and practice are handmaidens. Theoretical research on the taxonomy, morphology, and physiology of insects and fungi permits the ready detection of the disease-producing organisms and the determination of effective means of controlling these pests. Technical research in physical chemistry results ultimately in a practical bulletin (Texas Station, No. 490) on the effect of fertilizers upon the yield, size of boll, and earliness of cotton.

What seemed, in 1900, to be rather detached and theoretical research on substances which were then baffling mysteries, leads to practical information regarding the "Vitamin A Potency Required by Hens for Egg Production" in 1935. Extremely intricate, technical, theoretical, and impractical studies on differential calculus by "armchair" professors results, when applied by the agricultural scientist, in the intelligent planning, managing, and interpretation of grain variety tests and of fertilizer experiments. Similar examples can be quoted almost without limit.

History of Science

The preceding discussion and examples show that a science develops more or less methodically in two successive stages.

The first stage is the accumulation of information, whether true, such as the observations as to the effects of fertilizers and legumes on crop production, or imagined, such as the presumed effect of moonlight upon the viability of germinating seeds.

The second stage is the verification of observations and notions which are deliberately tested by an experiment in which there is a check in the form of a controlled or known set of conditions. Verification is necessary as a basis both for the elimina-

tion of non-factual information and for the classification and interpretation of the facts which constitute any body of knowledge.

Not every past occurrence or allegation can be verified by a present-day experiment. This is true alike of geologic volcanoes and Biblical miracles. The truth of such phenomena can generally be tested only by indirect evidence.

A scientist is not necessarily some mystical being who "talks big words" on some "theoretical" subject. Rather, a scientist is one of millions of folks who does good things well and seeks ways to do them better.

A scientist is any person who observes accurately and checks continuously both his observations and his means of observation. He endeavors to improve his knowledge of his vocation, or avocation, or aught else to which he gives attention, by planning and executing true experiments in which all conditions are the same and under his control except the one condition whose appearance will yield the unknown answer to be determined by the experiment. He has respect both for the theoretical and the practical. He seeks to distinguish facts from opinions, and yet he knows that whereas facts are beyond change or compromise, the perception of them may be inaccurate, the interpretation of them is often ephemeral and, in any event, subject always to change. He aims to express his knowledge in quantitative or at least definite terms. He knows that all truth agrees.

Thus, the true scientist not only possesses accurate knowledge, but he holds a mental attitude of open-mindedness and modesty, of progress and improvement, and of a profound love for truth.

A Good Lawn Is Its Own Reward

(*From page* 19)

is sown by crossing at right angles, north and south; the other two, by crossing the yard diagonally.

The seed may be raked in; however, this often results in the grass appearing to be sown in rows. A better method is to drag a light brush or bough of cedar or light pole covered with burlap over the yard. The yard then should be rolled with a light roller.

The first cutting of the young lawn should be done with a sharp sickle when the grass is about three inches high. A lawn-mower will pull up many of the young seedlings. It is best to remove the clippings from the young grass since they may pack down the young seedlings. As soon as the grass is established, mowings should be left on. They soon dry and disappear and help keep the soil in good condition.

Late afternoon or a cloudy day is the best time for mowing. Frequency of mowing depends upon the rapidity of growth. In summer it is well to keep the lawn one and one-half to two inches long. When the grass has grown an additional inch to one and one-half inches it is again ready for mowing. Serious injury to the grass may result if it is permitted to grow too long before mowing.

There has been considerable discussion as to whether to lime or not to lime. Suffice it to say that where soil is definitely acid, showing a pH reaction of 3.5 to 5, and Kentucky bluegrass is to be depended upon for sod, lime is needed. Bent grasses, of course, require an acid soil

for best results, whereas, Kentucky bluegrass seems to do best in soil with a pH reaction of 5.5 to 6.5. Lime may be used in any form, such as hydrated, burned, or ground to correct the acidity. Send a soil sample to your experiment station and ask for a test and recommendations before applying the lime.

A good stand of grass under oaks and maples can be obtained by thinning and high heading.

Weeds are the bane of the lawn-maker's existence and crab grass and dandelion are prime offenders. Sorrel or sour grass, mouse-eared chickweed, common speedwell, and moneywort are offenders but are never bad like the first two.

Crab grass is an annual, the seed starting germination in June and the plant dying with the first frost. It will not grow in shade of trees or buildings. Different methods have been recommended; however, the only successful one the author has found is to dig it out root and all, reseed the area, and watch diligently for any new seedlings. Once the lawn is freed of crab grass, and seedlings are dug out as soon as they appear, little trouble is had.

Dandelions, like the poor, are always with us. They may be dug out with a knife, being sure to get at least two-thirds of the deep root. Where a heavy infestation occurs, iron sulphate dissolved at the rate of 1½ pounds per gallon and sprayed with a fine mist under pressure may be used. This amount should cover 300 to 400 square feet of area. It is necessary to give three or four sprayings ten days to two weeks apart to give complete control. Make the first application when the plants are coming into bud.

The author has found that the best method of weed control is to make conditions ideal for growing your principal lawn grass, be it bluegrass or bent. There will always be some weeds; however, a thick, healthy turf will do more to prevent weeds than all other methods combined.

Ants, earthworms, grubs, and moles may be serious pests in the lawn. Fortunately, there are specific remedies for all except moles. A hole punched into the center of an ant-hill into which a tablespoonful of carbon bisulfide is poured and the hole closed with wet earth will do for these busybodies. (Caution—a cigarette, cigar, or pipe should not

be smoked when pouring carbon bisulfide. It is highly combustible.)

Earthworms may be controlled by spraying the lawn with two ounces of bichloride of mercury dissolved in 50 gallons of water. This should be sufficient to cover 1,000 square feet of area. The solution should be watered-in immediately after spraying. The earthworms must be raked up and destroyed to prevent poisoning birds or chickens.

Grubs may be controlled with arsenate of lead used at the rate of three to five pounds per 1,000 square feet. To give an even distribution, it should be diluted with dry sand or ashes. Water does not have to be applied; however, better results are reported when it is.

The bluegrass webworm caused severe damage to lawns in 1930. Its attacks are intermittent and it may be controlled by the same methods as recommended for grubs.

Moles are a pest for which little remedy, other than to trap them, can be offered. Trapping is not always successful.

Despite all the trials and tribulations which one may have in securing a uniform, well-grassed lawn, one is fully compensated when it is secured. Nothing adds so much to the setting of a beautiful home as a well-kept lawn.

One-third of the Nation's Celery

(*From page* 13)

heavy investment per acre, but celery growing without control of irrigation and drainage would be a failure. The proper maintenance of a suitable water table is one of the bedrocks of Sanford's success. Rainfall in Seminole county during the celery growing season is entirely inadequate.

With drainage and irrigation well under control, Seminole county growers have only to find the quantity and quality of plant foods that will grow maximum crops of high quality celery. In addition, it is a constant fight to protect this crop from diseases and insects. In this humid climate there is nothing that thrives better than insects and diseases, which prey upon an unsuspecting celery plant. Of course, there are other problems such as harmful residues accumulating in the soil, for these growers use from three to five tons of fertilizer per acre, and some of the land is double-cropped (two crops in the same season). Probably more trouble from residues would occur if this soil was not of a very porous nature. Another factor that minimizes this accumulation is the heavy rainfall during the rainy season that follows the celery harvest.

A celery crop must be constantly feeding night and day for about 90 to 120 days, and to work out a program that will keep it pushing ahead and developing is not a simple or inexpensive task. Although drainage and moisture are under control, temperature has its ups and downs, and temperature is a very important factor in growing celery. If the weather is warm, nitrification is rapid. Frequently celery grows too fast or rather faster than it can "fill out," as the growers say. Such celery, if conditions are favorable, may develop some body and quality toward maturity, but it is in no condition to stand any adverse conditions. As one grower expressed it, "Bring it along right, not too fast, filling out the growth as it appears. Once you get it out of balance, you will have difficulty making it into top celery."

The celery on the left was fertilized with 5-5-10. That on the right received 5-5-5. The additional five per cent potash produced a difference in yield of 156 crates.

This explains why most growers want to have considerable organic nitrogen in the fertilizers which they use at planting time, or early in the season. Organic materials break down gradually and feed steadily, which is essential to sustained progress. If we knew what the weather would be, we probably could feed our celery a little more economically by using more organics during the warm season and more minerals during cold seasons. But after all, safety, as far as it can be adhered to, is a good policy; and so growers use both organic and mineral ammoniates, starting with a large percentage of the former and increasing the minerals late in the season.

Yield and quality in celery are almost inseparable, that is, within limits the quality improves with the yield. A yield of 800 crates per acre is always better quality than when 400 crates are produced.

An adequate supply of potash is very essential to both the yield and quality of celery. A heavy potash ration not only increases yields and quality but is good insurance against physiological breakdown in the crop after it has been grown. In the tests conducted by the U. S. Department of Agriculture in the Sanford area, it was found that a fertilizer carrying 8 per cent potash applied at the rate of four tons per acre gave excellent results in both yields and quality.

In the muck sections of Florida, celery is planted as a spring crop, maturing in April and May. This is due to the fact that these lands are low and cold, but this proves to be a great advantage at the end of the season when high temperatures are so detrimental. In the muck areas both tile and open-furrow irrigation are practical, and where the latter is used, drainage is a serious problem.

If Florida celery growers could only buy an insurance policy of protection against insects and disease, many of their problems would be solved. No such policy is available, and toward the end of the season growers are almost constantly dusting, spraying, and looking out for blackheart and pink rot.

Notwithstanding the numerous hazards and the large capital investment, the outlook for celery growers in Florida compares favorably with other pursuits of agriculture.

Born Housewife

Then there was that five-year-old girl in Cleveland who overheard a neighborhood woman tell her mother that the stork had just brought a baby to the Joneses.

"It weighs seven pounds," she concluded.

"How much was it a pound?" asked the little girl gravely.

"As a Man Soweth"

(*From page* 21)

laboratory were acid and needed lime in order to grow alfalfa.

"As a man soweth, so shall he reap." This old saying has been repeated and repeated for countless generations, and is as true today as when first uttered. In the words of Dr. Lawrence H. Baker, "This saying calls to mind the picture of a man sowing the general acts of his life, and having them bring back in due season of human chance and destiny, a crop of fortune or of sorrow." If we would harvest good crops of alfalfa next year and the years that follow, we must sow good seed on well-fitted and fertilized soil.

Need New Potash Program

More and more our heavier silt and clay loam soils in Wisconsin are responding to potash fertilizers. Our old program for lime, phosphates, and legumes is falling short. I have previously described in this magazine the vast areas of potash-hungry sandy soils in Wisconsin, but we are testing hundreds of soil samples from the heavier silt and clay loams in the older farming sections of the state that are showing low reserves of available potash as well as low phosphorus content. These soils are definitely responding to potash treatment. We are recommending 0-20-10 and even 0-20-20 mixtures on these soils for alfalfa. In fact it is my belief that the wide-spread use of lime in Wisconsin is going to accentuate the need for potash. We have evidence to show that soils which before liming did not respond to potash treatment are now in need of potash for maximum yields of alfalfa. We have sold the liming program to farmers of Wisconsin, but the use of potash and even phosphates is still in its infancy.

Potash Helps Both Crops

The striking photograph which accompanies this article was taken on a farm in Rock county this year,—a dark-colored silt loam of the Carrington series in one of the best farming areas of the state. Potash in the mixture here made a marked showing over the straight superphosphate plot, both on the barley and the alfalfa seedlings. This field was limed at the rate of four tons per acre. Four samples of soil taken from different portions show the following analyses.

	Avail. Phos.	*Avail. Potash*
No. 1	Trace	100 lbs.
No. 2	10 lbs.	100 "
No. 3	Trace	100 "
No. 4	"	110 "

We have found that soil showing less than 200 lbs. of available potash will usually respond to potash treatment. The soil on this farm is very low in both phosphate and potash.

Tabulated below are the results of treatments on this Rock County farm:

Treatment	*Barley Yields Bus. per Acre*
4-20-10	43.7
Check	25.7
0-20-10	50.4
0-20-0	40.5

This demonstration was conducted on a farm owned by Geo. Hull of Whitewater, located near Avalon, Wisconsin, and operated by Clifford Zantone.

There was a marked difference in the growth of the alfalfa on the fertilized plots, as compared to that on plots which received no treatment. . . . The big difference will be seen on the alfalfa yields in 1936 and subsequent years.

And so whether it be a crop of boys and girls or crops of alfalfa, barley, or corn, if we would harvest good crops we must give them properly fitted and fertilized soil in which to grow.

Potash and Clover for Better Pastures

(*From page* 12)

Since there is considerable strain variation in wild white clover, it offers a fertile field for plant breeders and agronomists; but until the seed is available, the best way to obtain it is by high mineral fertilization and proper grazing management, which means close grazing and the repeated use of a mower if the vegetation gets up too high. A good mower, by the way, is a valuable asset to any pasture, because animals usually avoid the vegetation around their droppings. When cut, and the mowings are carried a short distance away and partly dried, they are relished by grazing animals. Mowing also keeps the pasturage in a succulent, vegetative stage and the weeds in check.

Functions of White Clover

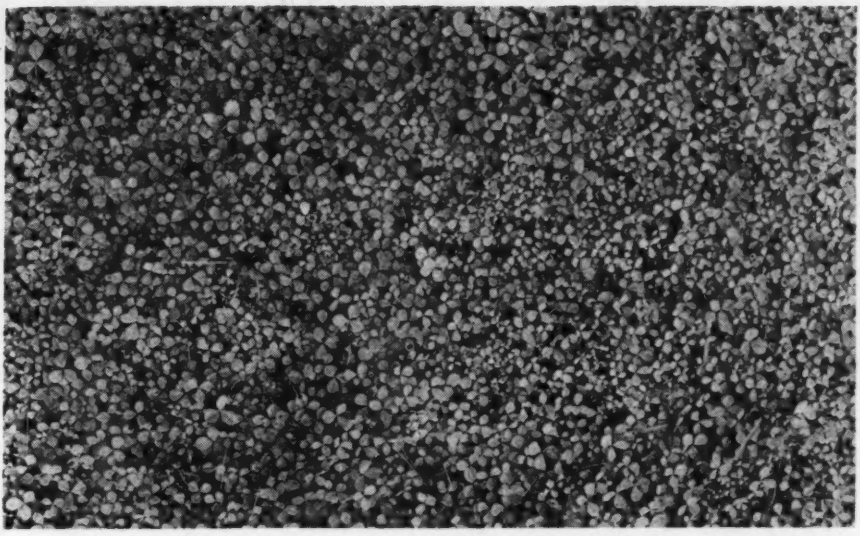
It is difficult to give wild white clover sufficient praise for its importance in making pastures productive and profitable. Some of the functions which this clover may play in pastures are the following:

1. It is higher in protein than grasses, and it is usually more palatable. Grasses growing in association with wild white clover are usually greener and contain more protein than the same grasses without this clover association. It is also quite possible that the percentage of digestible protein, in proportion to the total nitrogen, is higher in a clover-grass turf than pure grass with added nitrogen. This is perhaps even more true under close grazing, because the short grasses do not get a chance to properly utilize the high concentration of applied nitrogen before they are removed. The clover in a grass turf, however, has a tendency to supply this nitrogen more slowly and uniformly.

2. A good wild white clover turf tends to keep down the soil temperature during the hot summer months. At the Vermont Agricultural Experiment Station the soil temperature one inch below the surface averaged, during the summer months, about six to seven degrees cooler under a good clover turf than the temperature of the same soil under a fairly good timothy-bluegrass turf without clover. Usually the warmer the day, the greater the temperature differences became in favor of the clover turf. This reduced temperature is highly desirable and helps to account for the relatively good growth of pasturage during the hot summer months on a good clover sod. Under heavy rainstorms, it is also more efficient than the grass in reducing run-off, thereby helping to maintain the moisture supply.

3. In association with grasses this clover tends to produce earlier pasturage than grasses alone. This is because it helps to supply the grasses with nitrogen, thus giving the latter an earlier start in the spring. One of the main values of nitrogen on pastures is that it reduces barn feeding by allowing the animals to get out on pasturage earlier in the spring.

4. Wild white clover also has a tendency to produce pasturage later



A close-up of the wood-ash treated area shows the influence of potash in producing a thick stand of clover.

in the season than most grasses because of its period of growth. The maximum growth of most pasture grasses is early in the spring, but in the case of this clover the maximum growth is somewhat later.

5. It has a higher mineral content than grasses, and a higher proportion of calcium to phosphorus. This is desirable because it improves the mineral balance of the pasture herbage, making it more comparable to that found in milk and bone.

6. Wild white clover produces a very good turf which is firm and compact, because of its many stolons which are able to root at each node under favorable conditions, thus spreading over large areas in a short time. It has been noted that a small inconspicuous clover plant, with a liberal supply of minerals and close grazing, will often spread out and form a good turf over several square feet in one season.

7. While this pasture clover with all its stolons is considered a shallow-rooted plant, yet it has a main tap-root which penetrates the soil to greater depths than most grasses, thus being able to withstand relatively dry periods.

8. Wild white clover increases the organic matter supply of soils more rapidly than grasses alone. This is mainly due to its ability to spread and completely occupy the surface soil. Since it reduces soil temperature, the existing organic matter is not so rapidly decomposed; and since it reduces run-off, more moisture is conserved for additional plant growth.

Insure Come-back

There are no doubt other valuable characteristics which this clover possesses, yet these should be sufficient to make one desirous of increasing and maintaining it in pastures. While it is quite true that some seasons are better clover years than others, yet with proper care and management, this clover can be relied upon to increase pasture profits. The fact that it is able to produce seed even under relatively close grazing, helps to account for its rapid return after abnormal conditions of drought or winter injury, but to do this a liberal supply of minerals with lime and close grazing is very necessary.

The Inquiring Mind

(*From page* 16)

regularity, and all of the countries visited were paying great attention to this rotation, to the conservation of manures, and to fertilizing each crop according to its particular needs. Even the pastures are fertilized in much the same way as other crops. A mixture of potash and phosphate is applied at the rate of 200 to 500 pounds per acre in winter, and nitrogenous fertilizer at the rate of 100 to 200 pounds per acre is put on during the growing season. On small farms, most of this fertilizer is applied by hand.

In visiting experiment stations abroad, the party found that foreign farmers keep in close touch with the experiment stations, and are well informed concerning fertilizer needs of their land. Every branch of agriculture is making a much more complete study of the use of fertilizers than is made in the United States. The party even found that correct fertilization affects not only the yield of grapes in the vineyard districts, but also the wine made from them. In Berlin they were shown samples of wine made from grapes fertilized with a well-balanced fertilizer and from grapes poorly fertilized. The former had a degree of sprightliness and aroma not possessed by the other.

Long List of Writings

And now let us come back from Europe and look in again upon Professor Williams, methodical as usual, seldom missing even an hour from his work, supplying Editor Jeter with accurately written material whenever he needs it. His published writings cover, among many other things, "Estimation of Phosphoric Acid in Soils" (1896); "Variety and Distance Tests of Corn and Cotton" (1903); "Alfalfa Growing" (1906); "The Cotton Plant" (1906); "Effects of Applying Commercial Fertilizers to Corn and Cotton by Different Methods" (1913); "Source, Availability, and Suitability of Different Forms of Plant Food Constituents on Different Crops" (1914); "Long Staple Cotton in North Carolina" (1914); "Soybean Growing in North Carolina" (1915); "How to Use Lime on the Farm" (1916); and "Composition and Fertilizing Value of Farm Crops and Other Farm Materials" (1918).

Others are "Cultural Practices for Growing Cotton Under Boll-weevil Conditions" (1923); "Results of Fertilizer Experiments with Cotton" (1926); "Value of Lime on Cecil Clay Soil" (1928); "Results of Strawberry Fertilizer and Tillage Experiments" (1931); "Better Lawns in North Carolina" (1931); "Tobacco Fertilizer Recommendations for 1933"; and "Crop Rotation as a Material Aid to Soil Productiveness" (1932). These are but a few of the titles picked at random from the list which Mr. Jeter said is incomplete. How does one man do it all?

Knows Value of Recreation

The answer to that question goes way back to the boyhood of Professor Williams, and to the foundation for his almost perfect health. He started out, as we have said, on a farm in Camden County, where he learned to work before and after school, until it became a habit with him. But he also learned to play and to relax. As a boy he spent much of his spare time on Pasquotank River, on nearby creeks, and on Albemarle Sound ten miles away, in fishing, swimming, and sailing. On one occasion he, with two other boys, got lost for a whole night

on Albemarle Sound. He became familiar with all the nooks and corners of the nearby waters, and got to know intimately Roanoke Island, where the first English settlement was made in America. He knew how to fish by hook or net, and the best places to catch crabs on the shallow sandy shore adjoining the home farm. With two others, in two days, he once caught, just below Roanoke Island, 156 sea trout and blue fish that averaged two feet in length. On another trip to Topsail Inlet, fishing from the shore of the Atlantic Ocean, he caught a drum weighing 36 pounds, the largest fish he ever caught.

From this active and busy boyhood he went to college with a great interest in athletics, especially in football, and became the first captain of his college team. During all of this time he was developing a healthy body, which has served him so well that he has seldom been sick. He is a football enthusiast and very seldom misses a game in which the State College team is engaged. From time to time he goes back to his old home in the northeastern part of the state, where he follows his favorite hobby of fishing, as he did when a boy. Professor Williams is a great walker and never rides to his office except in the worst winter weather. When he is at any one of the six branch experiment stations, he is happy to be able to walk to the various plots, examining and studying the results of the agronomy research.

All of this accounts for Charles Burgess Williams' activity and capacity for work. He is a man who is careful and cautious. He allows no "half-baked" ideas to go out from his office, and he has probably as much information concerning the crops and soils of a given state as any man in the United States. His friends agree with Mr. Jeter, who says, "He is a clean, outstanding gentleman who attends to his own business and does not meddle in the affairs of others. He is devoted to his work, and I suspect that it is this very devotion, together with his quiet, unassuming ways, that has been responsible for his success in North Carolina."

Welcome Welfare

(*From page* 6)

period of security to come. If it did, where could they get themselves a bonus for arousing the bone-heads to impossible demands? They pose as watch-dogs and pointers, but most always they turn out to be only mongrels baying at the moon.

They unleash themselves on capital and labor, on farmers and on soldiers. They always find something professionally wrong in every administration. They fly from one roost to another, as the ballots blow. They put scare-crows in every man's peaceful dooryard. They create a vast protest business for the Western Union and break the backs of mail carriers. They sneak their doctrines into newspapers under a guise of information. They plead for "more laws" and then connive to make them "scraps of paper." There is less danger of government by dictators than by demagogues and dabblers these days.

Indeed, if the present American business war-cry is to be "let us alone," then let big business and its brethren of the forge and furrow yank off a few self-imposed barnacles whose chief mission is to foment domestic discord

Instead, let there be more real "brain-trusters" — using the word

joined by the aforesaid fomenters. Welfare comes only by cooperative facing of facts and the use of the vast mines of physical and economic science untouched and unknown to thousands.

If we might engage in a forum without being so much "for-'em" or "ag'in-'em"; if our debates were less sectional and more rational; if our statesmen were chosen on sanity instead of bitterness, then we might go places! Until public opinion is influenced by facts more than it has been hitherto, we shall not have any stable measure of getting and keeping prosperity any more than we have of gaining comfort, and not so much as we have of maintaining health

To date, the medical doctors, the surgeons, and the scientists have done more for mankind than either the engineers or the economists. I mean, they have made health more available to the many than comfort or prosperity is. I can get fixed up at a legitimate hospital without a nickel in my jeans, thanks to the physician's sentimental oath.

But I can't get a house, an oil-burner, electric lights, or a steady job without cash or credentials. Yet for my welfare as a whole, the house, the warmth, the lights, and the job are no less vital to me than a mended leg or lung.

TO be sure, we of America have progressed to the point where we won't allow anybody to starve or freeze, but it is at best artificial prosperity. Many grant it grudgingly, and thousands accept it with apologies. However, trends toward a safer and sounder era of unemployment insurance, with mass consumption and mass spending to match technological perfection, are plainly evident.

The old trade theory of profits through scarcity rather than abundance, imitated by the organized farmers of late, is bound to be laid aside. In its place we trust will arise a wider use of gadgets because folks can get them. Only last week I asked a group of young farm students how many had electricity and furnaces in their homes. About a quarter of them raised their hands. Meanwhile the history of their nearest power supply company reeked with stock-jobbing and financial sleight-of-hand,—whereas an investment in cheaper rural lines and easier credit for appliances would have put the same funds to sounder social uses.

IF, as I have hinted, we can rid ourselves of the rats on the ship of state who devour our confidence in each other and our respect for law and order, our way to prosperity and welfare is wide open. We have been comrades in a tough school of experience. Our lesson has pretty well soaked in. We are going to advance by brain-trusting more than trust-busting. That is, we will put our trust in thinking rather than bombast, in research rather than razzing.

No real American can be a pessimist about the days ahead. Why fret about the future of young Jack and Mary? We are planning the scenery for them much more assiduously than our ancestors directed the show that eventually culminated in the wrecks of recent years. Better to be forewarned and forearmed like they are than to be led blindfold into disaster. All this pity for the young generation is just so much blather.

Watching the gait taken by the sociologists and inventors lately, and seeing how fast the blinders are dropping from the eyes of some folks who formerly were led around by the nose, I have more hopes than horrors for 1936.

So it's not a case of "farewell to welfare"—it's "welfare, you are welcome; come in and stay with *all* of us!"

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

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POLITICS

A man had been brought before the court charged with vagrancy. Fixing a withering glare on the culprit, the magistrate thundered: "Have you ever earned an honest dollar in all your life?"

"Oh, yes, Your Honor," the accused answered meekly, "I voted for you in the last election."

A freckled lad was asked, "What made those red spots on your face?"

He said, "I guess it's my iron constitution rusting out on me."

Lady Bountiful: "Here's a penny, my poor man. Tell me, how did you become so destitute?"

"Beggar: "I was always like you, mum, a-givin' away vast sums ter the pore an' needy at Christmas time."

The question in the physical examination read: "How may one obtain a good posture?"

The country boy wrote: "Keep the cows off of it and let it grow a while."

PSYCHOLOGY

"I wish," complained the preacher, "that I could make my flock take more of an interest in Heaven. None of them seems to want to go."

"Tell them that children under sixteen are not admitted," suggested the helpful friend.

Local Junior: "Daddy, what is bankruptcy?"

Dad: "Bankruptcy, my boy, is when you put your money in your hip pocket and let your creditors take your coat."

Professor: "Can you give me an example of a commercial appliance used in ancient times?"

Student: "Yes, sir, the loose-leaf system used in the Garden of Eden."

CHEMISTRY

A farmer visited his son's college. Watching students in a chemistry class, he was told they were looking for a universal solvent.

"What's that?" asked the farmer.

"A liquid that will dissolve anything."

"That's a great idea," agreed the farmer. "When you find it, what are you going to keep it in?"

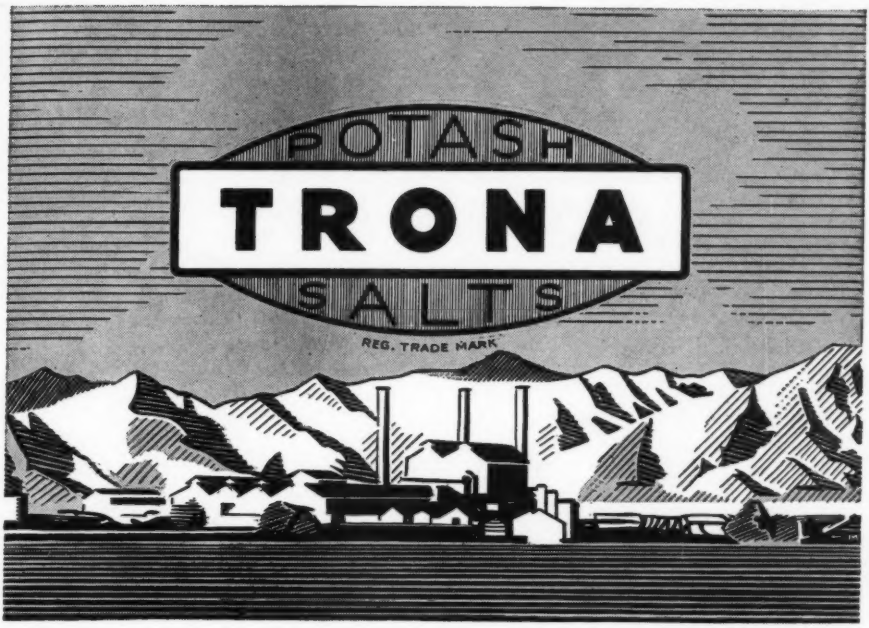
Teacher: "Who can define indigestion?"

Pupil: "It is the failure to adjust a square meal to a round stomach."

"This stuff you sold me might be all right for some things," said the baldheaded man, "but it hasn't brung back my hair. Look at them bumps on my head."

The druggist looked at the label on the bottle.

"Great Scott," he gasped. "I've made a terrible mistake. This is bust developer."



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Printed in U. S. A.